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APPENDIX TO THE JOURNALS

OF THE

SENATE AND ASSEMBLY

OF THE

THIRTIETH SESSION

OF THE

LEGISLATURE OF THE STATE OF CALIFORNIA.

VOLUME III.



SACRAMENTO:

STATE OFFICE, : : : : A. J. JOHNSTON, SUPT. STATE PRINTING.

1893.

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- 2—Report of the State Board of Horticulture, 1892.
- 3—Twelfth Biennial Report of the State Board of Health.

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ANNUAL REPORT
OF THE
STATE BOARD OF HORTICULTURE
OF THE
STATE OF CALIFORNIA,
FOR 1891.



SACRAMENTO:
STATE OFFICE, : : : : : A. J. JOHNSTON, SUPT. STATE PRINTING.

1892.

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CALIFORNIA
STATE BOARD OF HORTICULTURE.

ELLWOOD COOPER, President.....Santa Barbara,
Commissioner for the Los Angeles District.

L. W. BUCK, Vice-President.....Vacaville,
Commissioner for the Napa District.

S. RUNYON, Treasurer.....Courtland,
Commissioner for the Sacramento District.

J. L. MOSHER, Auditor.....San Francisco,
Commissioner for the State at Large.

FRANK A. KIMBALL.....National City,
Commissioner for the State at Large.

A. F. WHITE.....Santa Rosa,
Commissioner for the Sonoma District.

FRED. C. MILES.....Penryn,
Commissioner for the El Dorado District.

I. H. THOMAS.....Visalia,
Commissioner for the San Joaquin District.

A. BLOCK.....Santa Clara,
Commissioner for the San Francisco District.

B. M. LELONG, Secretary.....Ex officio Chief Horticultural Officer.

ALEXANDER CRAW.....Quarantine Officer.

ELLA F. HALLAHAN.....Clerk.

Office of the Board:
No. 220 SUTTER STREET, SAN FRANCISCO.

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ERRATA.

On page 99 (the square system) read number of trees to acre "one hundred and eight" instead of "one hundred and nine;" also, in table (square) on page 104, and in line 11 (same page) from below.

REPORT.

OFFICE STATE BOARD OF HORTICULTURE, }
SAN FRANCISCO, CAL., January 23, 1892. }

Hon. H. H. MARKHAM, Governor of California:

SIR: In accordance with law, we have the honor to submit herewith our report for the year 1891, being the third annual report since the law was amended (Act of 1889) from biennially to annually, and the eighth report since the inception of our Board. The delay in its preparation was through circumstances over which we had no control.

FINANCIAL STATEMENT.

The forty-second fiscal year closed June 30, 1891, and the following are the expenditures for the year:

Library	\$275 95
Janitor	207 75
Rent	1,983 00
Stenographer	200 00
Postage	690 85
Sundries	187 27
Traveling expenses	1,943 09
Supplies	324 17
Repairs	234 30
Telegrams	61 45
Expressage, freight, and cartage	424 58
Publishing	2,085 30
Furniture	548 50
Papers	64 25
Messenger	204 00
Special agents and experimenting	3,139 90
	<u>\$12,524 36</u>
Balance from forty-first fiscal year	\$26 02
State appropriation	12,500 00
	<u>\$12,526 02</u>
Expenditures	12,524 36
Balance	<u>\$1 66</u>

The expenditures of the present (forty-third) fiscal year, up to December 31st, are as follows:

Library	\$1,272 90
Janitor	80 90
Rent	675 00
Postage	121 50
Sundries	72 83
Traveling expenses	547 10
Supplies	50 60
Repairs	16 25
Telegrams	42 15
Expressage, freight, and cartage	159 40

REPORT OF STATE BOARD OF HORTICULTURE.

Publishing.....	\$1,910 25
Furniture.....	200 00
Papers.....	31 85
Messenger.....	43 00
Special agents and experimenting.....	468 05

\$5,691 78

State appropriation.....	\$10,000 00
Expenditures.....	5,691 78

Balance.....\$4,308 22

SALARY FUND.

Appropriation.....	\$4,800 00
Expended.....	2,400 00

Balance.....\$2,400 00

EXPERT TO FOREIGN COUNTRIES.

Appropriation.....	\$5,000 00
Expended.....	1,500 00

Balance.....\$3,500 00

Respectfully submitted.

ELLWOOD COOPER,
President

B. M. LELONG, Secretary.

Subscribed and sworn to before me, January 23, 1892.

[SEAL]

ALVAN FLANDERS,
Notary Public.

INTRODUCTORY.

TRANSACTIONS OF THE BOARD

AND

COMMISSIONERS' REPORTS.

CHAPTER I.

TRANSACTIONS

OF THE

STATE BOARD OF HORTICULTURE.

MARCH 10, 1890.

The Board met in Los Angeles pursuant to a resolution adopted at the meeting held in Fresno, November 8, 1889. The following Commissioners were present: Messrs. Block, Buck, Kimball, Miles, Mosher, Runyon, Thomas, and President Cooper. Absent: Commissioner White.

The minutes of November 4-8, 1889, were read and duly approved.

Nominations for the position of Vice-President, made vacant by the resignation of Commissioner Peck, were then declared in order.

On motion, the Secretary was directed to cast the vote of the Commissioners present for Commissioner Buck.

The Secretary cast the vote of the Commissioners present for Commissioner L. W. Buck, for the position of Vice-President, and he was declared unanimously elected by President Cooper.

The report of the Secretary was read, covering the period since the last meeting of the Board, and was ordered placed on file.

The Treasurer's report was then read, making the following exhibits:

Appropriation.....		\$12,500 00
Total expenditures since last report up to March 1, 1890.....	\$3,714 92	
Amount expended up to last meeting.....	6,569 61	
	10,284 58	
Balance		\$2,215 47

SALARY FUND.

Appropriation.....	\$4,800 00	
Expended	3,200 00	
Balance		\$1,600 00

The report of the Treasurer was, on motion of Commissioner Block, ordered placed on file.

REPORT OF THE EXECUTIVE COMMITTEE.

The Executive Committee then presented their report, as follows:

SAN FRANCISCO, CAL., March 1, 1890.

To the honorable State Board of Horticulture of California:

GENTLEMEN: Your Executive Committee beg leave to present for your consideration the following report, which is the result of their examination of the books, accounts, and vouchers in the office of the Secretary of the Board, as well as of all the property under the control of the

Board, including office furniture, fixtures, library, etc., made at the office of the Board, February 24 and 25, 1890:

First—The book of original entry, covering the period from July 1, 1888, to February 8, 1890, every entry being examined in detail, clearly showed the amount paid and for what it was paid.

Second—We examined as a whole all the bills paid by the Board from date of removal to present offices, about July 14, 1887, to February 8, 1890, and compared each bill with the receipt showing its full payment.

Third—We examined and appraised all the furniture, in most instances relying upon the bills for value, and where no bills were found, the value was estimated.

Fourth—The library we found to contain the following number of books: Twenty-one volumes turned over by the former to present Secretary; two hundred and two volumes secured through exchange; six hundred and eighteen volumes bought, and two hundred and eighty-seven volumes bought in paper covers or without covers, and which have been bound or are in process of binding—one thousand one hundred and twenty-eight volumes in all, and valued as follows: Twenty-one volumes, \$210, estimated. The values of the following were ascertained from the bills: Nine hundred and five volumes, \$1,235 90; two hundred and sixty-two volumes, \$100. One thousand one hundred and twenty-eight volumes, \$1,545, total value of library.

Fifth—Electrotypes and woodcuts, forming an exceedingly valuable collection, covering about eighteen superficial feet, cannot have cost less than \$1,000, although we did not separate the bills of items, so as to determine the exact cost. These cuts and electrotypes number three hundred and sixty pieces, some of them as many as five separate subjects.

Sixth—We found an itemized account of old furniture, waste paper, rubbish, and truck sold, amounting to \$79 50, said amount having been turned into the State Treasury.

Seventh—We found by the Secretary's report a balance of \$2,214 27 remaining to the credit of the Board to carry on all its operations till the close of the present fiscal year, June 30th. The average monthly expenses for the nineteen months from July 1, 1888, to February 1, 1890, have been about \$520. Applying this average to the remaining months of the present fiscal year, we find that \$2,600 will be required. However, from this amount there should be deducted one month's rent, \$135, not embraced in the above statement, and also the sum of \$223 64 in value of postage stamps now on hand, thus leaving the amount at the disposal of the Board about equal to the probable expenses to be incurred before the close of the present fiscal year.

Eighth—A careful examination of the various rooms and offices of the Board disclosed the fact that the total value of the furniture, fixtures, carpets, etc., amounted to \$2,700, which amount does not include the expense of putting up the various partitions, painting, etc.

Ninth—The actual running expenses of the Board, based on the amount disbursed in the nineteen months, July 1, 1888, to February 1, 1890 (not including salaries, which are provided for by law, nor the purchase of any permanent property), is estimated to be as follows:

Expenses of members of Board attending two Conventions	\$640 00
Expenses of members of Executive Committee attending two meetings.....	340 00
Expenses, incidental, two Conventions.....	150 00
Expenses of stenographer, two Conventions	500 00
Traveling expenses of two clerks, two Conventions.....	160 00
Expenses one year's rent, twelve months, at \$135 per month.....	1,650 00
Incidental office expenses, twelve months.....	1,284 00
Postage stamps, \$105 per month, twelve months	1,260 00
Total	\$6,154 00

This estimate is based entirely on the average expenses of the Board during the period reviewed, but cannot fairly represent our future requirements, especially when we consider the constantly increasing demands made on the Board for many purposes, among which we may mention the increasing demand of fruit growers for experimental work in suppressing our numerous fruit pests, and the study of diseases of trees and plants; the largely increased expense of the annual report, consequent upon its increased size. The present report being larger than any previously published, a greater sum will be required in its distribution, not only in postage, but in express and freight charges, in drayage, in paper for wrapping, in boxes for transportation in quantity to Conventions and districts. In fact, we may say that the work of the Board is increasing so fast in importance that its expenses, with the most rigid and exacting economy, cannot be estimated at less than \$6,250 for the coming fiscal year.

Tenth—A careful examination of the books of the Secretary develops the fact that during the period from April 17 to July 1, 1887, there was no money in the State Treasury with which to pay the absolutely indispensable expenses of the Board, and that the Secretary paid such bills to the amount of \$414, and that no portion of such indebtedness has been refunded to Mr. Lelong. We also found that Mr. Lelong had also paid out \$166 78 in discounts on State warrants, a part of such discounts having actually been paid to the officers of the Board. We also found bills to the amount of \$80 18, which were paid by the Secretary, and no part thereof has been returned to him.

We further found that while acting under the instructions of the Board, during the presentation and pendency of the amended horticultural bill before the Legislature, that the Secretary incurred expenses for traveling and other incidentals to the amount of \$362 30, itemized statements being rendered for every disbursement. We therefore find that there is now due to Mr. Lelong the sum of \$1,023 71, for moneys actually disbursed by him for account of the State Board of Horticulture, which sum does not embrace any charge for interest, which is properly chargeable for the use of his money.

For the coming fiscal year, June 30, 1890, to June 30, 1891, the appropriation is	\$12,500 00
Minimum estimate for expenses	\$6,250 00
Due Secretary	1,023 71
	7,273 71
Leaving a probable balance of.....	\$5,226 29

The publications of the Board must sustain the enviable character of the horticulturists of our State, and to do it every step must be an advancing one; and in this regard, we may say that we believe the dissemination of exact knowledge deduced from experiments, through the

medium of our publications, to be the most important feature in the work of our Board.

To summarize, we beg to say that after a careful examination of the offices of our Secretary, we find that his duties have been performed in an exceedingly satisfactory manner. We find the furniture and fixtures of the offices of the Board to be of a useful and not of an extravagant character, when the importance of this department is considered.

The general arrangement, neatness, and good order maintained at all times is highly commendable to our Secretary, and is worthy of great praise.

Respectfully submitted.

FRANK A. KIMBALL,
J. L. MOSHER,
ELLWOOD COOPER,
Executive Committee.

Commissioner Block made a few complimentary remarks and said he was, indeed, very glad that such report was made, and moved that the report be received, adopted, and spread in full upon the minutes of the Board, as the sentiments of the Board toward the Secretary, for the efficient services performed by him since his accession to the office. Motion carried unanimously.

Commissioner Block moved that the Executive Committee be and are hereby given full power to settle the account due the Secretary in any way they choose. Motion carried.

On motion of Commissioner Block, Commissioners Cooper, Mosher, and Miles were appointed to draft a suitable set of resolutions in memory of the late General M. G. Vallejo, former Treasurer and Commissioner.

The President made a statement with regard to a parasite that is now destroying the red scale in Florida.

Commissioner Block moved that the Executive Committee be authorized to procure said parasite for distribution in this State. Motion carried.

On motion of Commissioner Block, the Secretary was granted a leave of absence of eight weeks, said leave to be taken under the direction of the Executive Committee.

On motion, the Board took a recess, to meet at the call of the President, out of respect to the memory of the late General Vallejo.

RESOLUTIONS OF RESPECT.

MARCH 14, 1890.

The Board met pursuant to adjournment. All the Commissioners were present except Commissioner White.

The committee appointed to draft resolutions of respect to the memory of the late General Vallejo, submitted the following:

WHEREAS, It has pleased Almighty God to remove from our midst General M. G. Vallejo, our former Treasurer, and Commissioner for the Sonoma District; therefore, be it

Resolved, That in the death of General Vallejo we have lost a warm friend, and the

State a dutiful servant, who for many years occupied the position of Treasurer of this department;

Resolved, That we, the State Board of Horticulture, in session at Los Angeles, this the fourteenth day of March, 1890, extend to the family of the late General Vallejo our sympathy and condolence in this their great bereavement;

Resolved, That these resolutions be spread in full upon the minutes of the Board, and that a copy be engrossed and attested to by the officers of this Board, and transmitted to the family of the late General Vallejo.

ELLWOOD COOPER,
J. L. MOSHER,
FRED. C. MILES,
Committee.

Commissioner Block moved that the resolutions be adopted and spread in full upon the minutes of the Board, and a copy be transmitted to the family of the late General Vallejo. Motion carried unanimously.

Commissioner Block moved that the next State Convention of Fruit Growers be held at Santa Cruz, the date thereof to be fixed by the President. Motion carried.

Commissioner Buck moved that when the Board adjourn, it do so to meet at Santa Cruz, at the call of the President. Motion carried.

On motion of Commissioner Block, the subject-matter with regard to lithographic plates for the next annual report was referred to the Executive Committee, with full power to act.

The committee appointed to draft resolutions with regard to the work performed by the Secretary, presented the following:

To the honorable State Board of Horticulture:

GENTLEMEN: We most respectfully recommend the adoption of the following resolution as the sentiments of this Board towards our Secretary:

Resolved, That the thanks of the State Board of Horticulture are due and are hereby tendered to B. M. Lelong, Secretary of said Board, for the able and efficient manner in which he has performed the duties of his office, from the date of his accession to the office to the present date, and especially in the collection and preparation of the material for the report of this Board for the year 1889.

Respectfully submitted.

FRANK A. KIMBALL,
A. BLOCK,
L. W. BUCK,
Committee.

Adopted by unanimous vote.

The Board then adjourned.

REPORTS OF OFFICERS.

NOVEMBER 18, 1890.

The Board met in pursuance to call, at Santa Cruz. The following Commissioners were present: Messrs. Block, Buck, Miles, Mosher, Runyon, Thomas, White, and President Cooper. Absent: Commissioner Kimball.

The minutes of March 10-14, 1890, were read and approved.

TREASURER'S REPORT.

The Treasurer, Sol. Runyon, presented his report from March 10 to October 7, 1890. Said report showed the following exhibit:

Expenditures—March 5, 1890.....	\$364 93
Expenditures—March 31, 1890.....	1,848 32
Total.....	\$2,213 25

Leaving a balance from the forty-first fiscal year of \$1 02, which, with \$25 discount from a bill for Stenographer's fees, leaves a balance of \$26 02, which is credited to the forty-second fiscal year.

FORTY-SECOND FISCAL YEAR.

July 11, 1890	\$2,756 75	
July 30, 1890	402 80	
August 19, 1890	362 85	
September 4, 1890	483 24	
September 25, 1890	853 58	
October 7, 1890	734 12	
		\$5,593 34
Balance forward from forty-first fiscal year	\$26 02	
Appropriation	12,500 00	
		12,526 02
Balance		\$6,932 68

On motion of Commissioner Block, the report was accepted and ordered placed on file.

SECRETARY'S REPORT.

The report of the Secretary was read, covering the period since the last meeting, as follows:

To the honorable State Board of Horticulture:

GENTLEMEN: I have the honor to submit to your kind consideration this brief report, as your Secretary, since your last meeting:

The annual report of the Board for the year 1890 has just been issued, although it is still in process of binding. This report contains four colored lithographic plates, eleven photo-engraving plates, and numerous wood engravings. I exceedingly regret that press of time should not have permitted further investigations; this, however, will be followed through the winter months, and the results of the experiments so made will be issued from time to time in bulletin form.

In accordance with your views as expressed at the last meeting, the Executive Committee has caused an investigation to be made with regard to the parasites and predaceous insects that have been reported to exist in various parts of Florida. These investigations were carried on very extensively, and the results have been published in bulletin form. The orchards that had been reported as having been freed of scale insects by parasites were carefully examined, and were found to be yet infested, although very slightly. No parasites were found that had decreased the pests, but the trees had thrown off, or rather outgrown them to a certain extent, by the use of chemical fertilizers, which were applied to the soil very freely. By this method the trees are made to outgrow the damaged or infested parts of the trees. Everything that was considered of any value to horticulturists was looked into, and the trip was indeed very inexpensive, and the information obtained has proved of much good. We are now in communication with parties in various countries, and consignments of parasites and predaceous insects will be secured in this way.

The Executive Committee has had three meetings since your last session. At the meeting of July 1, 1890, there were present Commissioners Cooper, Kimball, and Mosher. November 18th to 21st, inclusive, was the date fixed for the holding of the Fourteenth State Fruit Growers' Convention, at Santa Cruz.

A meeting was called for July 30th, but no quorum being present,

Chairman Mosher adjourned the meeting to August 13th. Accordingly, the committee met to consider applications for the position of Quarantine Officer. After due consideration of all applications before them, Alexander Crow was selected as such. On motion of Commissioner Cooper, Mr. Crow was made ex officio Entomologist of the Board. Said appointment was made to take effect September 1, 1890. Miss Ella Halahan was instructed to fill the office during said interim.

It was ordered that two glass houses be immediately erected for the protection and propagation of the *Vedalia* through the winter. In accordance with the order made by the Executive Committee, bids were called for the erection of two glass houses covering orange trees eighteen feet high. The lowest bidders were J. M. Griffith & Co., of Los Angeles. Their bid was as follows:

Material for two glass houses	\$390 00
Glass and glazing	156 75
Hooks and hinges	2 00
Four hundred and eighty-six feet sash	8 17
Carpenter work	26 00
Total	\$582 92

Apart from this there were a few extras, amounting to \$12 05; the painting cost \$23 50, and the sixty-four square feet of fine brass wire mesh, used in the ventilators, at 55 cents per square foot, cost \$31 68, making the total cost, complete, \$650 15. These houses are very substantial, and will last many years to come. They were erected upon the grounds of Col. J. R. Dobbins, at San Gabriel. Colonel Dobbins has kindly offered to assist the Board in the undertaking. He will care for and watch the progress made by the *Vedalia* during the winter months without charge. Last winter it appeared very much as if the *Vedalia* had died out, and perhaps it was due to the efforts of this Board that they were preserved through the winter. Many colonies were placed in various parts late in winter, and from these places they were distributed all over the State in the spring. In the spring none could be found anywhere in the State, except where they had been colonized by the Board. The committee has felt that the risk of their living through the winter unprotected is too great, and it is to prevent any possibility of a failure that these precautions have been taken.

At the last Convention held in Los Angeles, it was resolved to present to Mr. Albert Koebele, the discoverer of the *Vedalia cardinalis*, a suitable memento, as a token of esteem from the fruit growers of California.

In accordance with the resolution adopted, the following subscribed most liberally: Mrs. Hannah Hollister, Santa Barbara; J. A. Graves, Los Angeles; A. B. & A. S. Chapman, San Gabriel; Sol. Runyon, Courtland; Ellwood Cooper, Santa Barbara; J. W. Wolfskill, Los Angeles; S. P. Stow, Santa Barbara; A. Block, Santa Clara; L. W. Buck, Vacaville; D. W. Coquillet, Los Angeles; "Rural Californian," Los Angeles; G. B. Griffith, Los Angeles; Sutter County Horticultural Society; J. DeBarth Shorb, San Gabriel; H. W. O'Melveny, Los Angeles; Tim Carroll, Anaheim; First National Bank of Pasadena, Pasadena; N. W. Blanchard, Santa Paula; George S. Patton, San Gabriel; Newhall & Hall, Duarte; W. H. Workman, Los Angeles; S. Richardson, San Gabriel; Germain Fruit Company, Los Angeles; Theo. Deming, Sacramento; G. F. Starr,

Yuba City; Fred. C. Miles, Penryn; F. E. Gray, Alhambra; Abbot Kinney, Lamanda Park; B. G. Stabler, Yuba City; N. C. Carter, Pasadena; E. W. Maslin, Sacramento; A. J. Cooper, Los Angeles; Sam McKinlay, Los Angeles; R. H. Gilman, Anaheim; A. C. Thomson, Duarte; John Burr, San Fernando.

It was decided that for the present the most suitable memento to be given Mr. Koebele be a gold watch, chain, and charm, and a set of diamonds for Mrs. Koebele. Accordingly, by special request, these presents were selected and purchased by two committees, consisting of Commissioners Mosher and Miles, W. H. Robinson of Stockton, Alex. Craw and Chris. Jorgensen of San Francisco. The watch bears the following inscription:

"Presented by the State Board of Horticulture, to Albert Koebele, the discoverer of the Vredalia cardinalis, as a token from the fruit growers of California, November 18, 1890."

I now turn the same over to President Cooper, who has been especially requested to present the same to Mr. Koebele and wife. I also turn over the balance of the unexpended funds and all vouchers thereto attached.

In closing, allow me to express to you my feelings of gratitude, and to thank you warmly for the most magnificent silver tea service which you, on June 24, 1890, commissioned to bear to me a birthday greeting.

The work you are doing and the results accomplished will forever stand to your credit, and what little I may have done to assist you in your good work has been with the aim of relieving you of part of the great responsibilities delegated to you by the people. It has been my good fortune to become associated with men who vie with each other to promote the interests and welfare of a great and noble State.

Very respectfully yours,

B. M. LELONG,
Secretary.

SAN FRANCISCO, CAL., November 15, 1890.

The report of the Secretary was adopted and ordered spread in full upon the minutes.

The Executive Committee laid before the Board the cause of the resignation of George Rice on July 1, 1890. The Board, after due consideration of the facts laid before them, approved the action of the Executive Committee by unanimous vote.

Commissioner Block offered the following resolution, which was adopted unanimously:

Resolved, That we, the State Board of Horticulture, approve the action of the Executive Committee in the matter of the appointment of Alexander Craw as Quarantine Officer.

Commissioner Block moved that the fifteenth State Convention of Fruit Growers be held at Marysville, in November, 1891. Adopted.

REPORT OF SEMI-ANNUAL SESSION.

APRIL 15, 1891.

The Board convened in semi-annual session, at the office of the Board in San Francisco. Present: Commissioners Kimball, Miles, Mosher, Runyon, Thomas, and President Cooper. Absent: Commissioners Block and Buck.

Letters were read from Commissioners Block and Buck, regretting their absence.

The minutes of November 18th were read and approved.

TREASURER'S REPORT.

The report of the Treasurer, Sol. Runyon, showed the expenditures made since the last meeting, as follows:

Warrants paid—October 25, 1890.....	\$462 32
November 26th.....	727 40
December 3d.....	1,855 75
December 31st.....	568 14
January 29, 1891.....	619 81
February 28th.....	529 33
	<hr/>
	\$4,759 75
Amount expended per last report.....	5,594 34
	<hr/>
Total.....	\$10,354 09
Appropriation.....	\$12,500 00
Balance on hand from forty-first fiscal year.....	26 02
	<hr/>
	\$12,526 02
	<hr/>
Balance unexpended.....	\$2,171 93

The Executive Committee certified that they had examined the report, and that the same was correct. The report was adopted, and ordered placed on file.

REPORT OF EXECUTIVE COMMITTEE.

The Executive Committee then presented their report, as follows:

To the honorable State Board of Horticulture:

GENTLEMEN: We, the Executive Committee, met on January 19th and on April 14, 1891, for the purpose of examining the books of the Board kept by the Secretary, and those kept by the Treasurer. We beg to report that we examined the books, and all vouchers in detail, from the date of our last report, March 1, 1890, to date, and find the same correct. At your coming meeting we shall submit a fuller report, embracing all the expenditures so made.

Very respectfully submitted.

J. L. MOSHER,
ELLWOOD COOPER,
FRANK A. KIMBALL,
Executive Committee.

The report was adopted, and ordered placed on file.

ELECTION OF OFFICERS.

The President announced the next order of business to be the election of officers for the next two years. The following were elected by unanimous vote:

President.....	Ellwood Cooper.
Vice-President.....	L. W. Buck.
Treasurer.....	Sol. Runyon.
Auditor.....	J. L. Mosher.
Secretary and Chief Horticultural Officer.....	B. M. Lelong.
Quarantine Officer.....	Alexander Craw.
Clerk.....	Ella Hallahan.

President Cooper, on taking the chair, delivered the following address:

ADDRESS OF HON. ELLWOOD COOPER.

In accepting again the position of President, I am not unmindful of the duties or responsibilities involved in so doing. We will be called upon to do more and make greater efforts in advancing the fruit industry. The attempt to abolish the State Board by the last Legislature ought to convince us that we will have to watch with the greatest care all legislative action, so as to prevent the possibility of such a calamity as would result in any change in our organization. Among the fruit growers and intelligent citizens of the State there can be but one feeling as to the importance of the work we are called upon to perform. We must accept the position only with the conviction that more is required of us.

The first horticultural bill was found to be inadequate, and required many amendments, which have been secured from time to time, until, as I thought, we had succeeded, at the hands of the previous Legislature, in getting a law that enabled us to render the greatest service to the fruit industry. We found that after all this struggle, and the devotion to the cause that stimulated our members in giving their time and best thoughts to the welfare of the State, that an attempt by ignorant legislators, either from partisan motives or for mere sensation, was made to wipe us out of existence with one sweeping stroke. The thing that we have to do is to prevent the possibility of such action in the future. If each coming Legislature is to tamper with the horticultural interests, we cannot do effective work nor secure the best service in our executive officers.

We have now a very effective working department; our officers command the respect of fruit growers, are intelligent, energetic workers, and are doing a service to the State that would be difficult to replace in the event of a change that might take place if their holding was insecure. Bordering States have seen the wonderful development of our fruit industry. All of them are untiring in their efforts to follow California's example. They are creating similar laws on the subject and will outbid us for effective service. We must, therefore, secure permanency to valuable workers. We must have an understanding among all the fruit growers of the State that any legislator who dares to tamper with the horticultural interests must be debarred from any further political position requiring the suffrages of our people. This will be simple and tangible, because we represent all political parties. In the event of corruption or misapplied funds, I am confident that each member of the Board

would be first to denounce it, and eager in his efforts to bring about a change. The law is sufficiently explicit and has been wisely drawn. If the Governors do their duty, bad appointments will not be made. That our enemies were insincere is proved by the fact that not a single vote was recorded against us when it came to a final passage.

In our interview with his Excellency Governor Markham, I am happy to state he is in accord with the fruit industries, and fully agrees with the great feature of our work—that is, to furnish the literature that will inform the fruit growers how to be successful in fruit growing.

Now, gentlemen of the State Board of Horticulture, I call upon you, each one, to present a plan (in writing) to be discussed at a Board meeting to be held in Marysville, November next, before the Convention convenes, as to how the legislative matter is to be presented to the fruit growers at said Convention. If there is to be uncertainty in the permanency of the work, I, for one, will feel discouraged and must decline any longer to take an active part.

An appropriation of \$5,000 has been given to us for the purpose of defraying the expenses of an entomologist to Australia and adjacent islands to search for parasitic insects, and send same (if to be found) to California for colonization and distribution among our fruit growers, to counteract the ravages of noxious insects so destructive to the fruit industry. We have written to the Secretary of Agriculture at Washington, asking of his department to place at our disposal Albert Koebele, to send on such mission.

The importance of such a mission cannot be overestimated. I recommend that we pass a resolution of thanks to the Legislature and to his Excellency Governor Markham, for placing this amount at our disposal. Something ought to be done, some plan organized by which our horticultural reports could be reproduced. We are now without books, with a constant and increasing demand. At the meeting of the next Legislature we must be prepared to present definite information as to the size and probable cost of reproducing our entire work—that is, to abridge, selecting all the most important parts, and putting in such shape that all the reports, commencing with 1885 and 1886, down to 1891, and including the same, would make one volume of about seven hundred or eight hundred pages. Such a book could have no equal in horticultural importance. It would be invaluable to our public schools—in fact, it is a necessity.

A certain number will be required for every school in the State. These books are now required by the curriculum of the schools. The children will not only be acquiring a knowledge of entomology, but a practical knowledge of fruit growing. Eastern tourists are purchasing lands in all parts of the State. It seems to be the ambition, the one desire, to possess a fruit orchard. We should encourage this, and furnish such information as would encourage them as well as save them from serious mistakes. To satisfy this demand will require twenty thousand copies. Some arrangement should be made to sell copies to other States and foreign countries. Probably five thousand copies would be sufficient for this purpose. Such books could be sold at a large profit to the State. I shall, at an early date, get the estimate from the Superintendent of Public Instruction, of the probable number necessary for the public schools, and at a future meeting present my final recommendation.

The horticultural industry is the growing industry; it will sooner or

later be the all-absorbing interest. We cannot take any steps backward, nor remain in a stationary position; we must advance. Our greatest advancement will be through the medium of public schools. There is a fascination in the study of natural science and the development of plant life. It has been demonstrated already, even with the little that has been done, that the school children have been eager in the pursuit of this knowledge. Baron Ferd. Von Mueller maintains, in his valuable lectures on arboriculture, that the human mind cannot be properly developed without coming in contact with growing plants. The care engenders a sentiment, a feeling, for the protection of their best development. No matter how degrading may have been the surroundings of little children, as soon as their notice and attention, their responsibility, are turned towards the care of plants, their watchfulness and guardianship are manifested in a remarkable degree. No instinct in children is so susceptible of development as their love of animals, their love of plants. It can be strengthened to such a degree as to be a bar against their selfish nature, a bar against surrounding evils.

We need a larger appropriation to prosecute our searches for parasitic insects. Hundreds of thousands of dollars are expended in fighting insects by the various methods, which, at best, are only partially effective, and may, in the end, be given up. We should not relax our efforts in the direction of procuring the natural enemies to destroy all noxious insects that disturb our fruits. If our intelligence is not employed in the right direction we will surely be defeated. Then let us adopt nature's plan, and call to our aid that which was created for the special purpose and placed within our reach. Our efforts will be crowned with success, and will pass down through history to the credit of California fruit growers that they were first to practically demonstrate this part of the plan of creation.

The question of economy in the State appropriations should not deter us from demanding ample funds for such purposes. The State has appropriated \$300,000 that the different industries could be properly exhibited at the coming World's Fair. In the past few years millions have been appropriated for prisons, insane asylums, homes of different kinds, places for the wicked and unfortunate. The criminal is better housed and fed than some of our worthy and most industrious. Are these classes to absorb all our surplus, or shall we do something to encourage the worthy, the industrious, who are struggling for mere existence? We are rapidly multiplying inmates for these various institutions. The misery and degradation caused by drunkenness, by idleness, and the whirl of shams in the extravagances of modern society, is appalling. Let us turn our sympathies a little from the vicious and unfortunate to the virtuous, industrious, and self-supporting. Our best thoughts and greatest energies should be given in their behalf. By education alone can we counteract the growing evils. The laws of creation, in their relation to the products of the soil, is the one important element in the instruction of our youths. It transcends everything else. Horticulture is the highest branch in this department. Our scope must be enlarged; we must assume a position adequate to the importance of our calling.

SECRETARY'S REPORT.

The report of the Secretary was read, wherein he informed the Board of the doings of his office, and subordinates, since his last report; also as to the legislative enactments, correspondence, etc., and the following expenditures since the last report, viz.:

Library.....	\$267 20
Papers, subscriptions to.....	60 40
Repairs.....	68 70
Telegrams.....	37 20
Office furniture.....	533 75
Janitor.....	146 75
Rent.....	1,393 00
Office supplies.....	248 27
Cartage, freight, and expressage.....	247 61
Stenographer.....	200 00
Postage.....	655 15
Publishing.....	2,017 10
Experimenting.....	2,495 67
Salary, special agents.....	391 60
Salary, clerk.....	140 00
Traveling expenses, Commissioners.....	789 00
Traveling expenses, officers.....	508 00
Sundries.....	154 60
Total.....	\$10,354 09
Appropriation.....	\$12,500 00
Balance on hand from forty-first fiscal year.....	26 02
	12,526 02
Balance unexpended.....	\$2,171 93

Also, that the Legislature had allowed for the uses of the Board, for the forty-second and forty-third fiscal years, the following amounts:

For the uses of the Board.....	\$20,000 00
For salaries.....	9,600 00
For expert to Australia.....	5,000 00
Total.....	\$34,600 00

REPORT OF THE QUARANTINE OFFICER.

The report of the Quarantine Officer was then read, and ordered placed on file, as follows:

SAN FRANCISCO, CAL., April 14, 1891.

GENTLEMEN: I take pleasure in submitting to you the following report of the doings of the division under my charge:

During the past year many thousands of fruit trees have been imported into California from other States and foreign countries. As the danger of introduction of new insect pests upon them has been to a certain extent great, I made it my special duty to carefully investigate their condition upon arrival on board of steamers in this port. When any pests known to be injurious were found upon the trees, they were kept in quarantine until disinfected or destroyed, in accordance with my instructions. Several lots of trees from Japan have been received infested with *Mytilaspis Gloverii*, which is one of the most destructive of scale insects, as it attacks the wood, leaves, and fruit. Those trees were destroyed.

Another importation of plants (*Gardenia Fortunei*) from Japan, contained specimens of the wax scale (*Ceroplastis rusci*) in various stages

of growth. Those plants were disinfected. I have frequently made careful inspection of them since, but could not find any live scale.

At present citrus trees are being imported from Tahiti, and so far no lot has been received free from injurious insects. Lately a lot was received, and found to be badly infested (even down in the roots) with three different kinds of scale, not yet known in this State; one was a species of *Lecanium*, one a *Mytilaspis*, and the other a very small *Aspidiotus*, that completely covered the stem. These trees were immediately cast into a fire and burned, root and branch. I hear of several lots that are expected soon; one is a full cargo per the schooner "Lena Sweasey," due about the end of the present month. The various County Boards and I are on the alert, and anxiously await their arrival, so that they may not be distributed throughout the State before they are carefully examined. To this end every precaution will be taken.

Many trees have been received by rail, and the County Boards of Horticultural Commissioners throughout the State have kept a sharp lookout, so that no infested stock should escape. The Eastern peach tree borer is the most destructive insect found upon this stock. This pest is very similar to the California species, and as trees have been imported from the Eastern States for many years past, it no doubt has been brought here in that way. In the early part of the season I examined nearly all the large lots received, and when found infested I immediately notified the owners to disinfect the trees by dipping into a strong and hot insecticide solution, and caused the destruction of all those that showed the presence of borers. I addressed letters to all the County Boards in regard to this, and in order that growers may be able to distinguish the borers and also protect their trees against attack, I have issued, under your instructions, a bulletin, in which the two species are illustrated; a full description is also given, also recommendations for their destruction.

I am pleased to report the success attending the measures adopted by the Board last August for the preservation and propagation of the Australian ladybird (*Vedalia cardinalis*). The two glass houses constructed under Mr. Lelong's direction at San Gabriel, and inclosing large orange trees, have proved well adapted for the purpose. On the fifteenth of October both trees were stocked with the cottony cushion scale, and by the end of December they had taken complete possession of the trees, and impressively reminded one of the experience of the past few years. A small colony of the *Vedalia* was placed in one of the houses, and the other was reserved for feed or future use in case of emergency. The ladybirds bred, and the young larvæ are now becoming numerous, and will soon be ready for distribution. Many fruit growers have already made application to me for colonies, the *Icerya* having again appeared in their groves.

In several localities the *Aspidiotus perniciosus* has decreased in numbers; a new internal parasite has been discovered, and will be watched with interest.

At present there is considerable discussion concerning what has caused the destruction of scale insect pests infesting trees in various sections throughout the State. In most every case where such conditions have been reported, the work of some agent is plain. I have made several examinations, and in most every instance found parasites at work, and to whom the work of extermination may be credited. Attention is

called to the various bulletins lately published, wherein they are fully set forth.

N. W. Motheral, under date of March 28, 1891, reports: "All the orchards in this part of Tulare County (Hanford) are comparatively clean. The scale is being rapidly destroyed by the *Chilocorus bivulnerus* and the *Scymnus marginicollis*. The trees infested with scale are covered with the larvæ of the *Scymnus*, and if no accident befalls them the pernicious scale will be a thing of the past in Tulare County. Nowhere else do they seem to be doing as good work as here, although at Mountain View, near San José, I saw this *Scymnus* in considerable numbers, and have learned that the scale has since disappeared. There is also a small fly, coming to maturity in June, preying on the pernicious scale, but their work is not extensive."

Upon some of the orange trees imported from Japan I found a few yellow scales (*Aspidiotus citrinus*), from which I hatched the same parasite that is at work in several orchards at San Gabriel. This goes to prove that we have got the true enemy of this scale. Bulletin No. 57 illustrates and describes this parasite, and also gives directions about colonizing them.

Next to insect pests, fungi diseases claim the attention of fruit growers, for annually great quantities of fruit are destroyed by this low order of vegetable life. Their spores are so light that they are carried by the wind and reinfest trees that have been disinfected, unless the fungicide contains chemicals that will remain active upon the tree during the growing season. Most fungi remedies to be effective have to be applied at least three times during the season, and as this implies an increased expenditure, the discovery of a more lasting fungicide will be the primary object in the experiments now under my charge.

During the summer months I will conduct extensive experiments to ascertain the best remedies for the various pests infesting fruit trees. The trees at that season of the year are more susceptible to injury, but, at the same time, the insects are in the most vulnerable stage, and the remedy used must be such as will not injure the tender foliage or fruit.

I have at all times tried to discourage the importation of trees into this State, especially when it is known that many of the districts where they are grown are badly infested with dangerous insect pests and diseases. This State is, so far as I know, free from the peach yellows (a constitutional disease of the peach tree in the East) and the Eastern plum curculio. Every precaution should be taken to prevent any of these pests or diseases from being introduced. However strange as it may appear, the fruit men are among the first to purchase such trees, even when aware of the danger not only to their own interests, but those of the entire State.

The correspondence in my division has been quite large; also the receipt of specimens for identification, the scope of which covers the entire State. But as it is desired to also learn of matters of importance to fruit growers from abroad, I have entered into correspondence with parties in foreign countries with the object in view of ascertaining anything of importance relating to parasites, predaceous insects, etc., that could be profitably and successfully introduced into this State.

Respectfully submitted.

ALEXANDER CRAW,
Quarantine Officer.

WORK OF THE YEAR 1891.

NOVEMBER 19, 1891.

The Board met in pursuance to call, at Marysville. Present: Commissioners Block, Buck, Kimball, Mosher, Miles, Runyon, Thomas, and White. Absent: Commissioner Cooper.

The minutes of April 15, 1891, were read and approved.

TREASURER'S REPORT.

The Treasurer, Sol. Runyon, presented his report since the last meeting, which showed the following exhibit:

Warrants paid—April 11, 1891.....	\$595 85
May 5, 1891.....	614 20
June 5, 1891.....	515 83
July 13, 1891.....	445 39
	<u>\$2,171 27</u>
Total expenditures forty-second fiscal year.....	\$12,525 36
Balance from forty-first fiscal year.....	\$26 02
Appropriation.....	12,500 00
	<u>\$12,526 02</u>
Amount expended \$12,525 36, less \$1 overpaid.....	12,524 36
Balance.....	<u>\$1 66</u>
FORTY-THIRD FISCAL YEAR.	
Warrants paid—July 13, 1891.....	\$1,342 62
August 6, 1891.....	814 00
September 16, 1891.....	584 55
October 3, 1891.....	1,866 68
	<u>\$4,107 85</u>
Total.....	10,000 00
Appropriation.....	<u>\$5,892 15</u>
Balance unexpended.....	

REPORT OF SECRETARY.

The report of the Secretary was then read, as follows:

To the honorable State Board of Horticulture:

GENTLEMEN: I beg to submit my report as your Secretary, since your last meeting held at San Francisco, April 15, 1891.

The forty-second fiscal year closed June 30, 1891, and the following are the expenditures for the year:

Library.....	\$275 95
Janitor.....	207 75
Rent.....	1,933 00
Stenographer.....	200 00
Postage.....	690 85
Sundries.....	187 27
Traveling expenses, Commissioners.....	1,131 39
Traveling expenses, officers.....	811 70
Office supplies.....	324 17
Repairs.....	234 30
Telegrams.....	61 45
Expressage, freight, and cartage.....	424 58
Publishing.....	2,085 30
Experimenting.....	2,634 30
Furniture.....	548 50

Papers.....	\$64 25
Salary, clerk.....	204 00
Salary, special agents.....	505 60
	<u>\$12,524 36</u>
Total.....	
Balance from forty-first fiscal year.....	\$26 02
State appropriation.....	12,500 00
	<u>\$12,526 02</u>
Total.....	12,524 36
Expenditures.....	
Balance.....	<u>\$1 66</u>

The annual reports of the Board for the years 1889 and 1890 have become entirely exhausted. The applications for these reports have by far exceeded our ability to supply, and postal cards had to be issued giving notice as to where the books can be seen for reference. The material for the coming 1891 report is now in course of completion, and we shall be ready to forward the same to be printed by the first of the year.

The field of investigation and experimentation having been so large, several bulletins have been issued to supply the desired information upon various subjects, as follows: "Olive Oil, its Uses and Adulterations" (Proceedings of the Olive Growers' Convention), five thousand copies; "The Peach Yellows; a Warning to Fruit Growers of the Danger of Introduction," five thousand copies; "Citrus Fruits," in two parts—Part I, "Lemon Curing;" Part II, "New Varieties of Citrus Fruits"—ten thousand copies; "Insects, Beneficial and Injurious; Remedies and Mechanical Appliances," ten thousand copies. The illustrations are mostly in colors, giving a better idea of the subjects therein treated.

The correspondence has greatly increased, perhaps due to new plantations and the many newcomers into the State who seek for information on many subjects pertaining to the fruit industry.

This year the work of this division has increased enormously, and several thousand packages of fruit were received and identified. Many new varieties of fruit have been examined, and illustrations made of those of any real merit, which will appear in special bulletins from time to time. The methods of processing are year by year advancing, and many mechanical appliances invented, which render the handling of the products, green and dried, much easier, and are great labor-saving devices. Various new methods have been illustrated in the several bulletins issued.

The deadly yellows that has ruined many of the peach-growing regions of the East was fully illustrated in a pamphlet, together with views of orchards ruined by it, to show the fruit men of the State what will be the result if it is introduced here. This bulletin has had a very beneficial effect, as the newspapers gave it wide publication, and dealers in Eastern trees have found it difficult to dispose of their goods, and several carloads that would otherwise have been sent here, having been so booked, were countermanded.

Never before has so many trees been imported into the State as this and last year. So far no trees or plants have arrived that are not free from insect pests. A shipment of three hundred and twenty-five thousand orange trees arrived from Tahiti with no less than nine different kinds of insects upon them; of these two were entirely unknown to this

coast and are very injurious, and proved hard to exterminate. One of these lives under the bark, and therefore cannot be killed with remedies. This cargo was placed in quarantine immediately upon arrival. The danger of introducing these pests being so great, proceedings were instituted before the Superior Court at Los Angeles. The Court, instead of ordering them destroyed, ruled that they must lay in quarantine till all insects upon them are dead. Since that time most of the trees have perished, and those that are still alive have been repeatedly treated by the owners, with only partial success in destroying the insects. The Attorney-General will soon institute proceedings, and it is to be hoped that the Court will order them destroyed.

This and many other cargoes that have arrived have required the personal attention of the Quarantine Officer, and a deputy was appointed temporarily to inspect all ships that arrive from foreign countries at San Francisco. At present we know of large consignments of trees that will begin to arrive soon from the East, and every precaution will be taken that no new pests be thus introduced. This division has, from time to time, issued such instructions and advice as occasion required.

Quarantine Guardians.

The following have been appointed Quarantine Guardians since my last report, and which commissions are now in force:

- April 13, Yolo County.—H. C. Howard, Inspector Woodland District.
- April 25, San Luis Obispo County.—E. B. Ketchum, R. M. Shackelford, and W. B. Prichard, county at large.
- June 1, State at large.—Ed. M. Ehrhorn, Deputy Quarantine Officer.
- July 16, San Benito County.—George S. Tremain, county at large.
- July 16, Orange County.—Hiram Hamilton, B. J. Perry, and I. N. Rafferty, county at large.
- July 17, Santa Cruz County.—J. A. McKune, C. Spreckleson, and D. M. Locke, county at large.
- August 7, Humboldt County.—C. C. Marshall, Inspector Eureka District; W. B. Shively, Inspector South Fork District.
- October 8, Ventura County.—W. I. Rice, J. F. McIntyre, and H. K. Snow, Jr., county at large.
- October 14, Los Angeles County.—John Scott, county at large; C. H. Richardson, Inspector Pasadena District; C. A. Coffman, Inspector Rivera District.
- October 24, Los Angeles County.—William Evans, Inspector Downey District; W. G. McMullen, Inspector Los Angeles District.
- November 2, Los Angeles County.—George A. Compere, Inspector Los Angeles District; T. B. Atkinson, Inspector Pomona District; Elmer Thomason, Inspector Azusa District; Charles Foster, Inspector Burbank District.
- November 10, Ventura County.—C. C. Elkins, Inspector Fillmore District; Rufus Touchton, Inspector Santa Paula District; Stephen Linton, Inspector Piru District.
- November 12, Fresno County.—J. R. Baird, George C. Roeding, and J. W. Watkins, county at large.

Executive Committee.

The Executive Committee has met as often as time permitted, and have allowed no work of the Board to be neglected. At times it has been impossible for them to meet, but they have been in steady correspondence, and have performed considerable work in this way.

On April 15th the committee met for the purpose of examining the books of the Secretary and those of the Treasurer, and to take an inventory of the property of the Board. They will no doubt present a report as to their findings.

At the meeting of July 9th the following was transacted:

RESOLUTION BY COMMISSIONER KIMBALL.

WHEREAS, The State Board of Examiners have signified their intention to disallow the payment of subscriptions to newspapers, journals, etc.; and whereas, we are in full sympathy with their action in the interest of economy; and whereas, the law establishing this Board (Section 8, Statutes 1883, p. 291, and as amended, in Section 8, p. 90), provides for the collecting of books, pamphlets, periodicals, and other documents containing valuable information relating to horticulture, and for the preservation of the same; the collecting of statistics and other information showing the actual condition and progress of horticulture in this State and elsewhere, etc.; and whereas, the newspapers subscribed to by this Board have been and are of great value and of great assistance to us in obtaining valuable information; and whereas, the cost of said papers, journals, etc., especially of scientific nature, does not exceed one hundred and fifty dollars per year; therefore, be it

Resolved, That we most respectfully request the honorable the State Board of Examiners to modify the resolution adopted by them June 12, 1891, with regard to newspaper subscriptions so far as relates to this Board, and that this Board have and will practice the utmost economy in the selection of only such papers and journals as are necessarily required to carry out the legitimate purposes of this Board.

Adopted.

The following resolution was also adopted:

Resolved, That a warrant for \$1,500 be drawn in favor of Albert Koebele, \$750 of which shall be paid to him in cash, taking his receipt therefor, and \$750 in form of a letter of credit to his order on some bank in Australia; and said Albert Koebele shall make monthly reports of expenses, and forward all vouchers therefor to this office.

The following resolution was also adopted:

WHEREAS, We are informed that some nurserymen, through the scarcity of peach stock for budding prunes, have contracted for large lots of Eastern peach stock for budding purposes for next season's delivery; and whereas, there is great danger of introducing into this State the "yellows," a deadly disease of the peach, on said roots, and on peach trees imported from the Eastern States, and while they may not now have the disease in the locality where they get this stock, yet we having no guarantee that the Eastern growers may not get trees grown in infested sections to supply the California demand from dangerous quarters; therefore, be it

Resolved, That we warn intending purchasers of the danger of getting trees affected with the "yellows" and other diseases and pests not now in this State; and be it further

Resolved, That we call the attention of all the Boards of County Horticultural Commissioners and Quarantine Guardians throughout the State to this danger, and to the rigid enforcement of the law in all such cases.

The date for holding the next Fruit Growers' Convention was fixed for November 17-20, 1891, inclusive, at Marysville.

The Secretary was instructed to request the members to make reports of the progress of the horticultural interests in their districts, and also the two Commissioners for the State at large, in accordance with previous custom and the law.

The propagating houses at San Gabriel have been moved on to new trees and stocked with cottony cushion scale, with which to feed the Vedalia through the winter months for distribution in the spring. This venture has proved a wise provision, and it is to these precautions taken that the preservation of this wonderful insect is due, as outside of these houses none have been found.

Respectfully submitted.

B. M. LELONG,
Secretary.

The report of the Secretary, as read, was approved and ordered spread in full upon the minutes of the Board.

QUARANTINE OFFICER'S REPORT.

The report of the Quarantine Officer was then read and ordered placed on file, as follows:

To the honorable State Board of Horticulture:

GENTLEMEN: Every steamship that has arrived from China, Japan, Australia, New Zealand, the Sandwich Islands, and Central America has been visited by me or my deputy and carefully inspected, to see that no plants or trees infested with injurious insects were landed by the passengers or crew. The ships' manifests were also examined, and whenever trees or plants were found the same were examined and disinfected, as a precautionary measure, and, in several cases where the trees were infested with known destructive pests, they were destroyed. The Japanese, and other firms importing trees and plants, were cautioned and instructed to notify their consignors to carefully inspect their shipments before sending to this country; otherwise, if found infested upon arrival they would be subject to seizure. This had a salutary effect, for subsequent importations were remarkably free from insects. I have made arrangements whereby we are notified by the Custom-house officials of the arrival of any plants or trees by sailing ships. I took this precaution, as one small lot of trees arrived in the spring that for a time escaped my notice. The arrival of sailing vessels is so uncertain that it is difficult to keep track of them.

The importation of three hundred and twenty-five thousand orange trees from Tahiti, which arrived at San Pedro June 15th, and specially referred to in my report to you dated August 31st, are still detained in quarantine, as the owners have failed to destroy the formidable "mining scales" that infested the trees, and have survived five fumigations with hydrocyanic acid gas. As I was advised to remain with the trees and prevent the distribution of any new pests into the orchards of the State, I could not leave there until the Court enjoined the owners from removing the trees. I have recently been informed by John Scott, Horticultural Commissioner of Los Angeles County, that one half of the trees died and were burned, and that the balance were dipped in Little's "Anti-Pest," one gallon to fifteen of water, on September 22d, and that upon inspection September 30th, the trees were slightly injured, but the "mining scales" were still alive; and upon October 13th he again inspected them, with the same result, and he has come to the conclusion that nothing will kill the mining scales without killing the trees.

In May we were advised that two species of caterpillars were doing considerable damage in the prune, cherry, and apricot orchards in the neighborhood of San José. I immediately visited the section and found the trees badly infested with *Anisopteryx autumnata* and the forest-tent caterpillar (*Clisiocampa sylvatica*). It was then too late to make satisfactory experiments for their suppression, as they had almost completed their growth; however, enough was done to prove that they can be checked or exterminated with Paris green, one pound to two hundred gallons, but to save the trees from injury it must be applied immediately after the young hatch. The former species can be prevented from ascending the tree to deposit her eggs in the fall by placing bands upon the trunks. Instructions in regard to this have been printed and distributed.

In my investigations of the Sacramento hop fields, after Mr. Lelong received the information that certain yards were infested with the destruct-

ive hop louse (*Phorodon humuli*), I failed to find the pest. The only insect upon the hops was the grain aphid (*Siphonophora avenæ*). In the same vicinity I also found the cabbage louse (*A. brassica*) and the plum aphid (*A. prunifolia*). The importation into hop-growing regions of hop roots from Oregon or Washington should not be allowed. There is also danger in importing plum or prune trees from the same States, as the winter eggs of the hop louse are deposited upon such trees.

No new species of scale insects have been found upon our fruit trees, and old pests and their life-histories are better known and remedies for their extirpation better understood and applied.

I had an opportunity to visit Tulare County recently, and found the trees that two years ago were seriously infested with San José scale now practically clean, and the trees healthy and vigorous. This condition I have observed in several orchards near San José.

J. W. Mills, of Yuba County, reports that a number of old apple trees in his district that have never been sprayed are now quite free from pernicious scale. In other sections, however, this scale appears as baneful as ever.

The red scale (*A. aurantii*) is still exempt from any internal parasite in California, but citrus culture in sections where it exists can now be profitably carried on by annually spraying or gasing the trees.

The parasite of the yellow scale in the San Gabriel Valley has kept the scale in check so much as not to be feared.

An internal parasite of the apricot scale has made its appearance at Berryessa, in Santa Clara County, which, it is to be hoped, will prove a check to this foe of the apricot and prune trees. Fully 90 per cent of the scales were parasitized. Next season, at the proper time, I will colonize this species in other sections where this scale is troublesome.

I learned in the spring of an internal parasite that destroyed the grasshoppers around Carowa, in New South Wales, and immediately addressed letters to J. P. Buggy, to secure colonies for California. In answer thereto I received a very interesting letter, dated June 1st, giving a very encouraging account of the work of the parasite, the successful introduction of which would be worth millions of dollars to this State alone. It was then too late to obtain them, as they are only found when the grasshoppers are out, that is, January to March in Australia. He has promised to secure them for us, and I have also written Mr. Koebele to visit that section and call upon Mr. Buggy.

The propagation of the Australian ladybird at San Gabriel has been very successful the past season, and the houses have again been stocked with cottony cushion scale to supply food for the Vedalia through the winter. The importance of this precaution by the Board has been favorably commented upon by the press and other publications in this country and Europe. The necessity of constant vigilance is evident from the fact that as soon as the Vedalia destroy all the *Icerya* in sight they disappear or die, and the experience in every case has been the reappearance of the scale a few months later, bred from scales the Vedalia could not reach. My attention was called by Scott Chapman, of San Gabriel, last spring to a colony of cottony cushion scale parasitized with *Lestophonus icerya*, the little dipterous that was introduced from Australia prior to the Vedalia. This is very remarkable, as it has had so very few scales to breed upon.

A colony of Coccinellidæ was received from Mr. Koebele when at the Sandwich Islands. The box containing them was placed in the refrig-

erator and they came through in good order. They were liberated at Mountain View, in Santa Clara County. This species preys upon Lecaniums and on the larvæ of other scale insects.

Last winter a carload of peach trees was received at Tulare from New Jersey, and planted in orchard form. One orchardist who planted part of the consignment became alarmed at the yellow and stunted appearance of some of the trees, and reported his fears to this office on October 15th. I immediately visited his place and investigated the matter. The trees he referred to I found were planted upon a sandy portion of his place, and during the extreme hot spell in July the trees had been irrigated by the basin system, the water coming in contact with the young stems; and the basins having been allowed to remain without cultivation, the bark was scalded close to the ground, completely girdling the trees. This stopped the flow and return of sap and gave the trees the sickly appearance. In justification to the owner I will state that he was absent from home during the irrigation, and the superintendence of the work was intrusted to others.

I also visited the other orchards planted from the same shipment, and found most of the trees in apparently good condition. However, I think it will be advisable to carefully inspect the trees when they start in the spring, as they came from a State known to be affected with the "yellows."

The laws relating to insect pests and diseases, in their present form, are more effective than formerly, but yet lack a clause that would give the proper authorities the power to condemn and destroy imported trees when found infested with dangerous diseases and insect pests, without having to bring an action before the Courts to declare them a public nuisance and to order them destroyed. Such a clause would have a wholesome effect in checking the wholesale importation of cheap, diseased, and pest-infested nursery stock from all parts of the world.

The uncertainty of destroying all pests by disinfection, and the impossibility to cure trees having the dreaded "yellows," should be sufficient grounds for the passage of such a law. The delay in the suit for the condemnation of the cargo of orange trees from Tahiti, which arrived on the fifteenth of June last, and which are still held in quarantine, as the owners have failed to destroy all the pests thereon, is more proof of the necessity of further legislation for the protection of the horticultural industry of the State. Such a law need not debar the importation of trees or plants for experimental purposes; but it should be obligatory upon the importers to notify some one in authority of the arrival of such trees or plants, and a careful inspection made before the trees are planted.

The law does not now require notice to be given of the arrival of trees or plants, and should they escape the vigilance of Horticultural Commissioners, or be received in counties that have failed to appoint inspectors, nothing would prevent their being distributed. This is a very serious defect and should be remedied as soon as the Legislature meets, as the importance and utility of such a clause cannot be questioned. Had such a restriction been in force in the past, there would have been no occasion for the introduction of parasites, or the annual expenditure of thousands of dollars in fighting insect pests.

ALEXANDER CRAW,
Quarantine Officer.

REPORT OF EXECUTIVE COMMITTEE.

The report of the Executive Committee was then read, as follows:

To the honorable State Board of Horticulture of California:

Your Executive Committee met in the office of the Secretary, at the rooms of the Board, on the eighth and succeeding days of July, 1891, and carefully examined and compared the books, accounts, bills, vouchers, and records of the Secretary, and also inventoried all the property in control of the Board, including office furniture, fixtures, library, etc., and beg to submit the following thereon for your consideration:

First—The period over which our examination extended began February 25, 1890, and terminated July 8, 1891.

Second—We found the books of "original entry," embracing the period named, to fully exhibit all disbursements of the Board and for what purpose made. Each and every bill was compared with the entries made, and found to be correct in every particular, and, on comparing vouchers with bills, all were found to correspond, and all were paid.

Third—The expenditures of the Board for the fiscal year ending June 30, 1891, were as follows:

Expenses of members of the Board attending two Conventions and expenses of Executive Committee attending two executive sessions	\$1,131 39
Expenses incident to two Conventions, including pay of Stenographer and traveling expenses of Secretary and Clerk	1,018 35
Rent	1,755 00
Incidental office expenses	473 52
Addition to furniture, carpets (including repairs on same), fitting up hall for Board and public meetings, steel office safe, rearranging rooms to properly accommodate the increased and rapidly increasing business of the Board, together with materials, lumber, sash, glass, doors, carpenter's and painter's work required in making said alterations and additions	782 80
Postage stamps	690 85
Additions to library	269 70
Drawings, engravings, electrotyping, translations for report of 1890, printing bulletins, and miscellaneous printing	2,082 10
Janitor	176 75
Messenger	172 00
Experimenting, including purchase of all materials and chemicals, fruits for experimenting, purchase and transportation of parasites, building glass houses for propagating <i>Vedalia cardinalis</i> and other parasites	2,623 85
Telegraphing	58 20
Express, freight, and cartage	365 61
Special agents	417 60
Subscriptions to papers and journals	61 25
Total amount of bills paid and journalized	\$12,078 97

The following bills, for which warrants had been drawn but not yet journalized, were also examined and found correct:

Deputy Quarantine Officer Ehrhorn	\$78 00
Alex. Crow, Quarantine Officer, traveling	36 35
Dutton & Partridge, account books	18 60
Packing-boxes	13 77
J. Caire, chemicals	3 90
Crocker & Co., printing	2 00
Chas. Reidy, lamps	29 50
Rent	135 00
Total	\$317 12

In addition to the above there were a few bills pending before the State Board of Examiners, which, if passed, would amount to the full appropriation of \$12,500.

A careful consideration of the valuable work done for horticulture through the medium of the State Board of Horticulture, and the vast field for still more valuable and extensive work, which may and should be done through the Board, prompts your committee to recommend that such action should be taken as will secure from the next Legislature appropriations commensurate with the importance of the work to be accomplished, to the end that exact information may be obtained as to the best methods for successfully prosecuting all horticultural pursuits, and when so obtained and published, that a sufficient number of copies be printed to secure the widest distribution, thereby saving vast sums of money which would otherwise be squandered in useless and fruitless experiments.

The annual reports of the State Board of Horticulture are every year marking a higher standard of excellence, and, as every year is a year of horticultural progress, so should the literature of horticulture correspondingly advance.

Again we take pleasure in saying that at the close of another year we find the work of our Secretary well done, and, although more work has been demanded of him during the past year than ever before, yet we find no portion neglected; he has fully sustained his reputation for successful and satisfactory administration of his office.

FRANK A. KIMBALL,
ELLWOOD COOPER,
J. L. MOSHER,
Executive Committee.

The report of the Executive Committee as read was adopted by unanimous vote, and ordered spread in full upon the minutes of the Board.

AMENDED REGULATIONS.

The following regulations were then adopted, amending the regulations adopted June 29, 1889:

I. All consignees, agents, or other persons shall, within twenty-four (24) hours, notify the Local Inspector or Quarantine Guardian of the arrival of any trees, plants, buds, seeds, pits, or cions, at the first point of debarkation in the State of California.

II. All trees, plants, cuttings, grafts, buds, seeds, pits, or cions imported or brought from any foreign country, or from any of the United States or Territories, are hereby required to be disinfected immediately upon arrival at any point where they are to be unloaded; and furthermore, if any of said trees, plants, cuttings, grafts, buds, seeds, pits, or cions are found infested with insects (or their germs), or with any fungi, blight, or other diseases injurious to fruit or to fruit trees, or to other trees or plants, they shall remain in quarantine for a period of fourteen (14) days, or until the Quarantine Officer, Quarantine Guardian, Local Inspector, a State Commissioner of Horticulture, or County Horticultural Commissioner can determine whether the said trees, plants, cuttings, grafts, buds, seeds, pits, or cions are free from injurious insect

pests, or their eggs, larvæ, or pupæ, before they can be offered for sale, gift, or transportation, as hereinafter provided.

III. All trees, plants, cuttings, grafts, buds, seeds, pits, or cions infested with any insect or insects (or their germs), fungi, blight, or other diseases that are known to be injurious to fruit or to fruit trees, or to other trees or plants, and liable to spread contagion, are hereby required to be disinfected before removal for distribution or transportation, or before being offered for sale or gift.

IV. All peach, nectarine, apricot, plum, prune, almond, or other trees budded or grafted upon peach or other stocks or roots, and all peach or other pits, cuttings, buds, or cions, raised or grown in a district where the "peach yellows" or the "peach rosette" are known to exist, are hereby prohibited from being offered for sale, gift, distribution, or planting within the State of California.

V. Fruit of any kind grown in any foreign country, or in any of the United States or Territories, or in the State of California, and found infested with any insect or insects (or their germs), or with any fungi, blight, or other diseases known to be injurious to fruit or to fruit trees, or to other trees, are hereby prohibited from being offered for sale, gift, or distribution.

VI. Transportable material of any kind, infested by any insect or insects (or their germs), or by any fungi, blight, or other diseases known to be injurious to fruit or to fruit trees, or to other trees, and liable to spread contagion, is hereby prohibited from being offered for sale, gift, distribution, or transportation; until said material has been disinfected by dipping it in boiling water and allowing it to remain in said boiling water not less than two minutes; such boiling water used as such disinfectant to contain in solution not less than one pound of concentrated potash to each and every ten gallons of water.

VII. All trees, plants, cuttings, grafts, buds, seeds, pits, or cions shall be disinfected by dipping in a solution of one pound of whale-oil soap (80 per cent) to each and every gallon of water; said whale-oil soap solution shall be kept at a temperature of 115 to 120 degrees Fahrenheit. Said trees, plants, cuttings, grafts, buds, seeds, pits, or cions shall remain in said solution not less than two minutes. After said trees, plants, cuttings, grafts, buds, seeds, pits, or cions have been disinfected, they shall remain in quarantine fourteen (14) days for subsequent inspection, if deemed necessary by a State Commissioner of Horticulture, County Horticultural Commissioner, Quarantine Officer, Quarantine Guardian, or Local Inspector, for further disinfection.

VIII. All trees, plants, cuttings, grafts, buds, seeds, pits, or cions shall be disinfected by fumigation with hydrocyanic acid gas, as follows: Said trees, plants, cuttings, grafts, buds, seeds, pits, or cions shall be covered with an air-tight tent, or box, and for each and every one hundred cubic feet of space therein, one ounce of fused cyanide of potassium (58 per cent), one fluid ounce of sulphuric acid, and two fluid ounces of water shall be used. The cyanide of potassium shall be placed in an earthenware vessel, the water poured over the said cyanide of potassium, afterwards adding sulphuric acid, and the tent, or box, to be immediately closed tightly, and allowed to remain closed for not less than forty minutes. After said trees, plants, cuttings, grafts, buds, seeds, pits, or cions have been treated with hydrocyanic acid gas, as above directed, they shall remain in quarantine for fourteen days, for subsequent

inspection, if deemed necessary by a State Commissioner of Horticulture, County Horticultural Commissioner, Quarantine Officer, Quarantine Guardian, or Local Inspector.

IX. All trees, plants, cuttings, grafts, buds, seeds, pits, or cions imported or brought into the State shall be inspected upon arrival at first point of debarkation, and if found infested with injurious insects which have not been destroyed by the remedies required by Rules VII and VIII of these regulations, they shall be proceeded against as a nuisance.

X. Any person or persons having in their possession any trees, plants, cuttings, grafts, buds, seeds, pits, or cions infested with any insect or insects (or their germs), or with any fungi, blight, or other diseases injurious to fruit or to fruit trees, or to other trees or plants, and who refuse or neglect to disinfect the said trees, plants, cuttings, grafts, seeds, buds, pits, or cions, as required by Rules VII and VIII of these regulations, after having been notified to do so by a State Commissioner of Horticulture, or County Horticultural Commissioner, Quarantine Officer, Quarantine Guardian, or Local Inspector, the said trees, plants, cuttings, grafts, buds, seeds, pits, or cions shall be declared a public nuisance, and shall be proceeded against as provided by law.

CHAPTER II.

COMMISSIONERS' REPORTS.

REPORT OF F. A. KIMBALL,

Commissioner for the State at Large.

To the honorable State Board of Horticulture:

GENTLEMEN: In conformity to a resolution adopted by the Executive Committee, "that each member report the condition of horticulture in his district," I hereto append my report as Commissioner for the State at large.

Developments in horticulture which have taken place during the few years last past have been so unprecedented that little more than allusion can be made to the varied and various industries properly classed as departments of horticulture.

My personal observation during the past quarter of a century nearly, has been more particularly directed to the portion of the State lying south of Point Concepcion, and still more particularly to the county of San Diego, a territory embracing an area nearly equal to that of New Hampshire and Vermont combined.

In 1868 her catalogue of fruits included two orange trees, one apple, a few trees bearing a fruit which, from its form, was known as a pear, half a dozen date palms, a pomegranate hedge, and a few scattered shrubs, about four hundred olive trees, three hundred and forty-seven of which comprised the orchard planted by the Mission Fathers subsequent to the year 1769, and three small vineyards of Mission grapes, situated about fifty miles apart.

The counties of San Bernardino, Los Angeles, and Santa Barbara were much further advanced, horticulturally, particularly in the cultivation of the orange, lemon, walnut, and olive, which were shipped from these counties in sufficient quantity to be quoted in the market reports.

Planting of fruit trees had long since ceased, or so nearly that a young tree of any variety was a rare sight, as it was then considered that further planting would only result in glutting the market, which was little else than local—transportation facilities being confined to one steamship line, making one trip per month, with freight rates absolutely prohibitory. Nearly the entire southern half of the State was a vast stock range, and the counties comprising it were denominated, by their more aristocratic neighbors, as "cow counties."

These conditions had existed for many years, and were a bar to an influx of population till, in the fullness of time, the revolving cycle had again reached the point when these barriers must be broken down and the latent resources of the country developed, to the end that the increasing number of inhabitants should be provided with such subsistence as the generally improved and improving condition of the

people demanded. "Frijoles" and "jerked beef" could no longer constitute the larger part of the every-day diet of the people. Horticulture was soon to revise the "bill of fare."

The knowledge of the value of this, at *that* time almost unknown region, spread rapidly; natural and artificial obstructions were removed by the increasing population—increased mainly by immigration of people totally unused to existing conditions. These immigrants brought with them ideas born of an environment naturally similar to their new surroundings, and no time was lost in putting them into practical operation.

Soon "sagebrush and cactus" disappeared, and "fruits good for food" occupied their places, and where a few years before there was but one family, badly housed and worse fed, *now* hundreds of families are living in absolute comfort, surrounded with luxuries which unlimited wealth, under less favorable circumstances, cannot procure. All this change has been wrought by a simple change of pursuits; in the one case accepting what nature chose to offer, in the other demanding all she could produce.

To horticulture alone is this change to be ascribed. True, heretofore a subsistence was gained, but not of a character which excited the intellect to exertion for its cultivation and consequent elevation; it did not induce a demand for school houses, churches, social societies, good roads, or any roads at all; in fact, society itself was in just the condition which its surroundings created.

In the other or present case, we find the new conditions have created a demand *for*, and the country is now dotted over *with*, school houses and churches, social organizations are almost without number, and a condition of society exists of which any country might justly be proud; and horticulture is the foundation on which it all rests.

Take away horticulture and the industries dependent upon it would soon fade from sight, and a few years would see our school houses without scholars, our churches without pastors or people; society would hold its meetings in the saddle, with a riatta suspended at one side and a revolver at the other; and our *roads* would be reduced to trails; in fine, the days of "frijoles" and "jerked beef" would return and the country would lapse into its former condition.

Little more than allusion can be made to our phenomenal growth in population, and the more than phenomenal growth which will give California at fifty years of age a position as far advanced as that of other countries which have celebrated their second centennial.

Would we continue this upward march to supremacy, we must provide the means whereby it may be attained; by this I mean that every aid to horticulture must be brought into requisition.

Possibly a shade of disappointment may pass through the mind of one of our most advanced horticulturists, should he chance to see a record of his prophecy made in 1884, and recorded in the report of the State Board of Horticulture of that year, from which I quote:

Our home market is more than supplied. The reduction of freights, in some distant future, to the northern Territories and the East will undoubtedly help the market. The production of plums, prunes, and apricots has now reached such dimensions as to cause the anxious inquiry on every side as to what shall be done with the vast product *now* produced and the thousandfold increase of the near future. Pears, owing to the blight, are needed to supply some parts of the East, but Arkansas, Kentucky, Tennessee, Northern Georgia, and the Western Carolinas and Virginia can produce pears sufficient in ten years to supply the world. The Yankees will have to eat their own pippins, drink their

own cider, and eat their own canned and dried fruits. The margin of soil and climate is in our favor, as against the Eastern grower; but that it is our mission to supply the East, South, and West, and the whole world with fruit is a preposterous idea that the future will soon dispel. Europe, with her cheap labor and experience, can furnish the whole world with prunes at 4 cents per pound, and become rich. Spain, Greece, and Italy will be glad to supply all christendom with raisins for their plum puddings at almost as cheap a rate, and the ocean is their highway, while *we* must pay a proscriptive toll on the way to *our* market.

The planting of orchards and vineyards should correspond with the supply needed on this coast and the probable demand for Eastern and foreign consumption. An area of plums, prunes, and apricots is *already* planted more than sufficient to supply the demand for twenty years.

As a *prophet*, the writer above quoted has not proved a success, as has been proved, by the area then planted having been many times multiplied and the *demand* for the products of horticulture has increased at a greater ratio than has the area planted. Statements like the one quoted, from such high authority, have had a tendency to make timid those whose opportunities for obtaining facts in relation to horticulture were confined to a narrow range; yet horticultural developments have wonderfully progressed in face of all the failures predicted; notably in the case of Riverside, from whence were exported in 1884 *fifty* carloads of oranges and lemons, and in 1890 fifteen hundred carloads were shipped.

More recent plantings, not only of citrus, but of all other fruits and nuts, in various sections in all the counties denominated as Southern California, have developed the same astonishing increase in output of products, and it appears from careful investigation that no particular county in the section of the State under consideration, nor any particular section of any county, can claim a monopoly of resources, though in many cases only partially developed, yet such progress has been made in all sections as to warrant the prediction that to persons inclined to horticultural pursuits it is quite a matter of personal preference, or perhaps fancy, in what section he shall cast his lot.

Very much of the progress to be seen on every hand may be attributed to the better understanding of "*the what*" and "*the how*" to do, and not a little of the requisite knowledge has been acquired through the great number of Conventions of fruit growers and the accompanying friendly competitions to decide *where* the best fruit was grown and who grew it.

Many of these Conventions have been held under the auspices of the State Board of Horticulture, and the proceedings have been widely distributed through its publications, which, with the vast amount of information brought together from other sources, has unquestionably been a large factor in elevating this vast area, comprising almost half of the State, from a stock range, with land valued but little above the government price, to a productive capacity which *pays* the interest at 6 per cent per annum on not alone \$1,000 per acre, but instances are not wanting where 10 per cent per annum has been realized on \$10,000 per acre, which statement is made without qualification.

The profits to be derived from horticultural pursuits are to be affected by rates of freight, and it is confidently believed that a gradual reduction will take place; if not otherwise, then by the introduction of competing lines of railroad, which will help to compensate for any reduction in price of fruits, should such occur. Other compensations for a retreat in average prices of fruits will be in improved methods of cultivation, stimulating fertilizers, and improved varieties.

To the end that every element which will tend toward increasing our powers of competition may be considered, I wish to strongly recommend to the fruit growers of the State that every influence be brought to bear on our law-makers that the powers of the State Board of Horticulture shall be so enlarged, and such specific requirements shall be made, as will place within reach of every fruit grower such information as will prevent mistakes in planting, so that the cherry would not be planted where the prune should be planted, nor the orange where the apricot should be planted; that a fruit which will not succeed in a northerly exposure should not be planted there; that domestic and commercial fertilizers should be analyzed, and the results made accessible.

I am willing to say that I believe there is no other industrial pursuit which absolutely requires intelligence in so high a degree as does horticulture, nor is there another field so large. Is there another man who labors who has so untiring a helper as nature? There are difficulties to be encountered by the horticulturist which are unknown to the skilled mechanic. The State should educate him. I would have a copy of each and every State Horticultural report in every school library in the State.

I have purposely avoided reference to localities, there being so many in every county to which reference could be made with satisfaction and pride, that to leave out one would be not only unfair, but unjust, and to name them all, with the particular and peculiar advantages of each, would extend this report beyond all proper limits.

REPORT OF J. L. MOSHER,

Commissioner for the State at Large.

To the honorable State Board of Horticulture:

GENTLEMEN: The growth of the fruit industry is phenomenal; in fact, it is the leading industry, and it seems to be the efforts of our fruit-growing people to combine to improve and bring this industry to the very highest standard, this being done in perfect unison. There are no secrets kept from the public. In fact, those commencing new in the business are warmly welcomed and the advantages of past experience readily given. In no other industry is the right hand of fellowship so warmly extended.

I have visited the orchards in many counties, and everywhere is the work of horticulture rapidly advancing. In most every fruit section horticultural societies have been organized; and by meeting monthly, fruit growers are enabled to compare notes and profit by the experience of their neighbors, by an interchange of ideas, etc. They are also better able to ascertain information outside of their respective localities, greatly to their benefit. San Diego County is entitled to much praise in this respect, as there are twenty-eight organizations of this kind in that county, holding weekly and monthly meetings, and all meet in general convention every three months. Thus the questions considered in their weekly and monthly meetings are brought before the general assembly for action.

A horticultural society for the southern district has been organized, with headquarters at Los Angeles, and is doing much good in the advancement

of horticultural pursuits. However, before the organization of that society, and many years before, a pomological society was organized, which is still in existence, and meets at different places during the year, enabling fruit growers to come together often and discuss matters of vital importance to their industry. County and local societies also exist in San Bernardino, Santa Barbara, Ventura, Orange, and San Luis Obispo Counties. Kern, Tulare, Fresno, Stanislaus, San Joaquin, Amador, Sutter, Butte, Tehama, and Humboldt have similar organizations, and much interest is manifested in them. Solano, Yolo, Napa, Sonoma, Alameda, and Santa Clara also have active societies, which, from the reports of their meetings as given in the various journals, are doing much good and imparting valuable and useful information. And last, but not least, the State Horticultural Society, with headquarters at San Francisco, enables fruit growers near the bay to meet monthly, and very important matters are considered from time to time. Almost every fruit-growing county now has a Board of County Horticultural Commissioners, and they are doing most excellent work, and are highly to be commended, and the State has been largely benefited from the results of their labors.

Santa Clara, one of the largest fruit-producing counties, has been the most dilatory in the appointment of Inspectors and Commissioners, but now seems to see the benefits of such appointments, and is pushing forward with energy. The Board of Supervisors have passed stringent quarantine ordinances, and seem anxious to do everything to advance the fruit industry.

There has been a persistent endeavor to ship into our State infested fruit and other trees, but the defiant expression of the people and the press, the energy, zeal, and exertion of our State Quarantine Officer, County Horticultural Commissioners, and Boards of Supervisors, have enabled us to prevent the planting of large importations by placing them in quarantine upon arrival, and many of which have been destroyed.

I think it is to the interest of the people to also know that Eastern trees do not thrive in California as the home-grown trees do, on account of the quality of the trees, climate, soil, or long transportation. I was invited to visit an orchard in the eastern part of the State, as it was not doing well. On inquiry I found they were Eastern trees, bought from traveling agents. The trees bought for prunes turned out to be plums, and a large portion of the peaches were dead and dying, although they were on rich soil and well cultivated.

My own experience proves that Eastern trees do not thrive well here. Several years ago I bought trees of a home nursery. They were sold to me as California grown, but I afterwards found they were Eastern trees. They did not do well under the most careful attention, some dying, others partly dying, and I had to keep replacing, until after four years I have taken out the last tree.

Probably one of the most important measures at the present time, is the movement to have the freight reduced on all boxed dried fruit to all Eastern points. At the present time the bulk of our dried fruit is shipped in sacks, the larger portion of which upon arrival in the East is repacked in boxes and put upon the market under all kinds of brands. If the freight could be reduced enough so that the fruit in boxes could be delivered in the East as cheap as in sacks, nearly if not all the fruit

would be shipped in boxes, under the grower's or packer's own brand. This would guard against the many frauds that may be perpetrated. It would also be an impetus to growers and packers to put up their fruit in good and attractive form, and would also command better prices. If people could see the fruit that is shipped in sacks on its arrival East, the sacks badly worn (and often torn) from the hundreds of miles of travel, and the fruit thick with sand and dust, they would hardly recognize it. There are many other reasons why dried fruit should be shipped in boxes. I am certain that if this matter is brought before the railroad companies in the proper form, they will readily see that it is to their advantage, and the desired reduction will be obtained, to the great benefit of California.

REPORT OF I. H. THOMAS,

Commissioner for the San Joaquin District.

To the honorable State Board of Horticulture:

GENTLEMEN: Your Commissioner for the San Joaquin District respectfully reports that he has recently visited the principal points of his district where horticulture is made the leading industry, and was pleased to find everything in the horticultural and viticultural industry lines prosperous; not alone this, but the agricultural development of the San Joaquin Valley (which is two hundred and fifty miles long and an average of ninety miles in width) has been both remarkable and phenomenal.

Hundreds of miles of irrigating ditches have been constructed in the valley during the past year, and by the aid of water thousands of acres of land that have heretofore been known as desert have been made to blossom as a rose.

Where systems of irrigation have been introduced lands have been subdivided into colony lots, thus enabling men of limited means to secure homes of their own, where they can abide in happiness under their own "vine and fig tree."

With increase of population have come commodious school houses, and no like area in the world with equal population is as well supplied with commodious school houses, where the colonists' children can have the advantage of a good education, and thus become intelligent American citizens.

Fresno County has undoubtedly made the greatest material progress during the year. Statistics show that it required over two thousand cars to move their products during the past year, and it is estimated that the raisin yield this season was over two million boxes, and the value of her exports for this year will be near \$10,000,000.

Tulare County follows close to Fresno County in progress, and her growth during the last three years has been very remarkable. From the present outlook her acreage of trees and vines will be more than double in the next two years. Considerable attention is being given to the growth of oranges and lemons, which are found to do well in the foothills and along its borders. Porterville has already attained a wide reputation for her oranges. Lemons are found to be a very profitable crop in several places, and seven hundred acres of the "Cove Ranch," eighteen miles east of Visalia, have been subdivided into colony lots,

where this fruit will be propagated on a large scale, experience having proved the land and climate especially adapted to their cultivation.

Kern County has also awakened to her possibilities, and by the adoption of the colony system for populating her lands, is making rapid progress in horticulture. Orchards and vineyards planted in the last year or two have made a surprising growth, and the quality of fruit produced cannot be excelled anywhere in the State.

Merced and Stanislaus Counties have a large acreage adapted to fruit trees and vines, and when the system of irrigation now in progress in those counties has been completed, and water spread over their rich lands, they will not be behind their sister counties of the San Joaquin Valley in the production of fruits and raisins.

They have the soil, which only needs the revivifying influence of water, which can be easily obtained through a system of canals and ditches.

There are yet enough of uncultivated lands in the valley, that can readily be placed under a system of irrigation, to supply comfortable homes for one million families, and these lands can be secured to-day at prices varying from \$30 to \$100 per acre.

Three lines of railroads paralleling each other pass almost through the entire length of the San Joaquin Valley, all under the control of the Southern Pacific Railroad Company. These roads furnish better transportation facilities, so far as accessibility for the producer is concerned, than are found in other portions of the State, none of our products having to be hauled a great distance to reach a railroad station.

The "West Side" Railroad, lately completed between Tracy, San Joaquin County, and Armona, Tulare County, opens up a large extent of very productive country. This road will soon be extended south from Armona, leaving Bakersfield seven miles to the east, and forming a junction with the main line at the head of the valley, near Caliente Creek. This will open up an extensive body of fine fruit land that is now lying idle.

One tract of land on this new line, known as the "Weed Patch," fifteen miles south of Bakersfield, and consisting of two hundred thousand acres of good land, will soon be supplied with irrigating ditches. This accomplished, and there is no reason why this particular section should not become the home of the orange and the fig, as well as of other fruits.

The soil in the San Joaquin Valley is so varied that localities can be found in parts of it for the growth of citrus as well as deciduous fruits. There is a thermal belt extending along the entire eastern side of the valley, and the growing of oranges, lemons, limes, as well as of stone fruits, has proved a success there. Oranges are grown with success in the foothills east of Fresno, at Oroquieta, Kaweah, and Porterville, in Tulare County. At the latter named place a large acreage has been devoted to citrus fruits, and the success met with in their culture is inducing the planting of a much larger acreage.

This section is also well adapted to deciduous fruits.

The best lands found for the growth of stone fruits, so far, are embraced in the reclaimed swamp land found near Bakersfield, Hanford and vicinity, and at Visalia.

I am pleased to report that the vines and trees growing in my district are generally in a healthy condition, the pernicious scale being a thing

of the past, leaving only the red spider and the codlin moth to contend with, and these can be easily conquered by the use of the remedies recommended by the State Board of Horticulture.

REPORT OF A. BLOCK,

Commissioner for the San Francisco District.

To the honorable State Board of Horticulture:

GENTLEMEN: The condition of horticulture in the San Francisco District is in most respects favorable. The general financial results to growers during the fruit season of 1890 were such as to greatly stimulate the planting of trees, and the demand for the product of the nurseries was unprecedented, leading, in many cases, to the importation of trees from Eastern nurseries, mostly peaches, but prunes also to a limited extent, grown in the East on special contract. These Eastern trees were in most cases well grown and of fair appearance. A search, however, disclosed the presence of a limited number of the Eastern peach-root borer, which differs in some very small particulars from the Pacific peach-root borer, which is found in some places within the district. Active measures were inaugurated to disinfect the trees by dipping in hot soap solution, with only partial success. Warnings were given by the local horticultural journals, and personal inspection was so close that it is not believed this pest was introduced. The danger, however, is so great, not only in case of the borer, but of the plum curculio and the peach yellows, that some effective measures should be taken to prohibit the use of nursery stock from sections of the country liable to be troubled with yellows or curculio.

Santa Clara County has attained much prominence by the extent of its orchards. The following figures, giving the number of fruit trees at present in the county, made up from private memoranda, may be considered tolerably accurate:

	Bearing.	Not Bearing.
Apples.....	55,000	20,000
Apricots.....	240,000	150,000
Cherries.....	72,000	50,000
French prunes.....	400,000	375,000
Plums.....	65,000	25,000
Peaches.....	250,000	285,000
Pears.....	60,000	30,000
Quinces.....	4,000	-----
Olives.....	6,500	7,000
Oranges.....	3,000	1,000
Lemons.....	300	200
Limes.....	200	-----
Figs.....	1,000	1,000
Almonds.....	12,000	8,000
Walnuts.....	1,000	700

Strawberries, 260 acres; blackberries, 62 acres; raspberries, 40 acres.

The product of the orchards for the present year is more difficult to ascertain than usual, on account of the great amount of dried fruit still scattered among the growers who have dried their own. There are prob-

ably not less than 25,000,000 pounds of green apricots, possibly 30,000,000; of French prunes, not less than 40,000,000 pounds of green fruit; of peaches, 26,000,000 pounds; of cherries, 7,000,000 pounds; of pears, 5,000,000 to 7,000,000 pounds; of oranges, 4,000 boxes. There are many things which convince me that these estimates are much below the actual production, for the local use is very large, and the channels through which it passes are numerous and varied.

The condition of the district is very favorable as regards insect pests. Three years or more ago considerable alarm was felt at the rapid increase of the cottony cushion scale, all sorts of trees becoming infested, such as roses, ivy, walnut, locust, deciduous fruit trees of almost every kind, while citrus fruits were being abandoned. The introduction of the *Vedalia cardinalis*, and its distribution by public-spirited citizens, has practically removed this pest, and, at a late date, only a very few were known to exist; some of these have been supplied with the *Vedalia*, and no danger is feared. I can truly commend the action of the State Board in carefully breeding this valuable scale destroyer.

The pernicious scale, so prevalent and dangerous a few years ago, has almost entirely disappeared, and we think no district within the State is now so free from this pest as the region round about San José. The agent of destruction in this case is undoubtedly the twice-stabbed ladybird.

Serious results from codlin moth can always be prevented by seasonable spraying. The canker worm and one or two sorts of leaf-eating caterpillars caused considerable damage. Among other remedies proposed against these I should desire to see further experiments made with white hellebore, which I have tried, but not sufficiently to be entirely satisfied. It seems to promise much.

The pests giving most trouble the past season are the apricot scale (*Lecanium armeniacum*) and the black scale (*Lecanium olea*), the latter appearing on plum, prune, and apricot on the west side of the Santa Clara Valley, and evidently injuring the trees materially. The sprays used against these have not been as effective as they should be, and I recommend special attention and work to discover something better. The plum aphid has troubled more than in many years before, there being quite a notable absence of their natural enemies.

The twice-stabbed ladybird, when present in large numbers, reduces the apricot scale materially, and another parasite has thinned them out in some portions of Santa Clara Valley.

No curculio has been observed, nor any evidence of the presence of yellows or other destructive diseases of trees.

I do not believe so large an area will be planted in trees this year as last, still trees have been contracted for by the thousand, and the amount planted will be considerable. I do not believe the area of table grapes will be increased, except possibly in the Santa Cruz Mountains.

I believe the culture of berries is increasing in area and importance.

REPORT OF A. F. WHITE,

Commissioner for the Sonoma District.

To the honorable State Board of Horticulture:

GENTLEMEN: It is the design of this report to give a very general description of some of the physical characteristics and horticultural capabilities of the extreme northwestern part of California. For fuller details reference is made to the "Reports of the County Boards of Horticultural Commissioners," found in the published annual reports of the State Board of Horticulture.

The Sonoma Horticultural District consists of the counties of Marin, Sonoma, Lake, Mendocino, Humboldt, Trinity, Del Norte, and Siskiyou—eight in number. The territory thus designated is a narrow, irregularly shaped belt of land, including nearly one half of the seacoast of the State, and extending from the bay of San Francisco northward about four hundred miles to the Oregon line. There are three inland counties—Lake, Trinity, and Siskiyou—the others all have landing places accessible for ocean steamers, and there are many intervening shipping points constantly visited by smaller vessels.

The eastern boundary of the district is the highest summit of the Coast Range of mountains, which attains its greatest elevation through its central and northern sections, and overlooks the valley of the Sacramento through its entire length. This valley terminates in a plateau with an altitude of from three thousand five hundred to four thousand five hundred feet, and includes all the northeastern part of the State, and extends far into Oregon.

Siskiyou County comprises three million eight hundred and ninety thousand acres of this plateau, and is distinguished for its deep gorges and cañons, for its impassable precipices, and for the roughness and extent of its "lava beds," which cover continuously thirty-four townships in its northeastern portion. The Coast Range and the Sierras unite about the line of its southern boundary, in the neighborhood of which are Lassen's Peak, the Black Buttes, Twin Sisters, and other mountains remarkable for their magnitude and height. From the midst of these, and surpassing them all in every attribute of physical greatness, is Mt. Shasta, a splendid old volcanic cone which rises fourteen thousand four hundred and forty-two feet above the level of the sea. To the westward the plateau is divided into a series of high ridges and of lofty mountains, which pass through many windings and breaks, but generally run parallel to the coast, and, taken together, constitute the Coast Range. Southward these mountains generally decrease in altitude and are less rugged. But at intervals through their whole extent mines of gold and silver, of cinnabar and copper, of lead and of iron, have been discovered and are worked with success.

The area of this district is estimated to be thirteen million nine hundred and fifty-seven thousand acres, a little more than twenty-one thousand eight hundred and seven square miles—an area much larger than the whole of Switzerland, larger than Greece, and almost as large as Holland and Belgium combined—and yet it is said that more than one half of it is too mountainous for cultivation. It abounds in small valleys of every conceivable shape. Some are nearly round, but most of them are long and narrow and irregular, conforming closely to the

contour of the hills with which they are surrounded, or to the windings of the streams along the margins of which they most frequently occur.

With the exception of the higher peaks and bare precipices, nature has spread over all this extent of territory a deep, rich soil, the product of the dissolution of rocks representing almost every geological age. Glaciers and earthquakes, fire and frost, tempests and whirlwinds, those irresistible disintegrating forces of nature, split, hewed, and ground even the hard granite to powder, while the milder but no less efficient chemical agencies reduced it to an impalpable pulp. When the process of assimilation was sufficiently complete the earth brought forth grass, herbs, and trees, and huge forms of animal life, and we trace out their fossilized remains as they lie scattered over the hills, attesting the circumstances of their growth and the facts of their existence. Radical changes occurred later on, but the vegetable mold of ages mingled kindly with the loams and clays, and warmed, fertilized, and adapted them to the wants of the different classes of plants of the present age.

It is, moreover, a well-watered country. Springs cold and hot, medicinal and pure, burst forth from its rocks and from the sides of its hills. There are multitudes of living streams, brooks, creeks, and rivers winding through the cañons and valleys. The Smith and Klamath, the Mad River, the Eel and Russian Rivers, are among the more important. Rhett Lake, Klamath Lake, and Clear Lake all afford pleasant navigation for small steamers, and villages along their shores are rapidly becoming places of enterprise and of public resort. The average annual rainfall varies from twenty-one inches in Marin County to seventy-four inches in Del Norte. The snows which accumulate in immense bodies on the sides of the high peaks and of the lofty ridges, are great reservoirs to be melted by August suns and brought down to supply the needs of the thirsty soil in the rainless season. Then, the winds from the ocean blow inland at the same time and are laden with moisture, which they distribute broadcast. With such never-failing resources there is no need of irrigation, and it is not practiced.

The seabreeze modifies the heat of summer and tempers the cold of winter. At an elevation of fifteen hundred feet above the level of the ocean the annual average temperature is from 52 to 60 degrees, indicative of a climate peculiarly favorable to the complete development of every variety of vegetable life not absolutely tropical nor Arctic.

Marin County includes the mountainous peninsula between San Pablo Bay and the Pacific Ocean. It has an area of three hundred and twenty-six thousand acres, and extends from the Golden Gate north to within a few miles of Bodega. It has a greater length of coast line than any other county in the State. Its hills rise abruptly and attain their greatest altitude two thousand six hundred feet above sea-level, in Mt. Tamalpais. There are many small and fertile valleys, sparsely covered with oak and laurel, and on the sides of the mountains and in the cañons there are clusters of madrones and of stunted pines. There is a grove of redwood trees covering five or six hundred acres on the shoulders of Mt. Tamalpais. Nearly all the deciduous fruits are grown in localities sufficiently protected from the winds of the ocean. About two thousand acres are now in vineyards in full bearing. It is claimed, however, that in the annual average yield of dairy products per cow, Marin excels that of any other county in California, and that it is scarcely equaled by any county in the United States. These pasture lands extend along the

coast farther north in long stretches four or five miles in width, with but little variation in value.

Adjoining this dairy belt on the east, and running from a point a little north of Bodega Bay, through the whole length of the district, is, in some respects, one of the most remarkable forests of timber in the world. It varies in width from ten to fifteen miles, but is very irregular; and along Eel River is from twenty-five to thirty miles in width. It is narrower farther north, and entirely disappears about the Oregon line. It is roughly estimated to cover an area of at least one million acres. There are many varieties of trees in this forest, among which are the pines, the firs, the cedars, and others, but those which are the most prominent and attract special attention are commonly known as "The Redwoods" (*Sequoia sempervirens*). In size and height they are second only to the "Big Trees of the Sierras" (*Sequoia gigantea*). It is not known that these trees grow elsewhere in any country. The *Gigantea* is found only in small groves, often remote from each other, and may be the remnants of the forests of some former geological age. They have fallen into destructive hands, and without special governmental care will soon pass away.

There are groves of considerable extent of the redwood (*sempervirens*) in Monterey, Santa Cruz, and San Mateo Counties, but they are disconnected and can hardly be called forests.

The great size and height of the redwood trees and their crowded position excite universal surprise. It is not uncommon for them to measure ten, twelve, and fifteen feet in diameter, and attain a height of two hundred or two hundred and fifty feet. There are places where they occupy for standing room fully two thirds of the ground. Generally their trunks are straight and symmetrical, and often without a knot or a limb for one hundred and fifty feet.

The great value of redwood lumber has long been known on the Pacific Coast, and is now acknowledged in the Eastern States, in England and France, and wherever it has been carried in commerce. Only more recently, however, has it become known that there is no wood which surpasses it for all ornamental purposes. The stumps and roots, generally regarded as worthless, are naturally most beautifully curled, and when properly polished meet the demands of the most refined tastes for absolute elegance.

The eastern border of this forest is lined with groves of pine, cedar, fir, and spruce, which rapidly multiply towards the north and east. Great bodies of this timber crown the summits and cover the sides of the higher peaks. In Trinity, Del Norte, and Siskiyou Counties they form into dense and extensive forests of great value.

"Lumbering and mining" have been and are yet to a considerable extent the principal resources of the people.

Most of the lower hills and valleys are sparsely covered with white, black, chestnut, and evergreen oaks, intermingled with madrona, laurel, mesquite, ash, buckeye, maple, black walnut, cottonwood, mountain mahogany, willow, alder, yew, mace, and other indigenous trees.

This part of California, so remote from the great thoroughfares of the country, and so rugged in its appearance, attracted but little attention in the early history of the State. The Russians made a small settlement at Fort Ross in 1811, and it is stated that they, in 1814, obtained at the Spanish Mission Dolores the first peach tree ever introduced

into this district. It was planted at the fort, and so protected and cultivated that it did not come into bearing until 1820. Two or three years later other peach trees were procured from Monterey, and in 1817 grapevines were imported from Lima, which fruited in 1823. In 1820 an importation of one hundred trees was made, consisting of apples, pears, peaches, cherries, plums, and prunes. They commenced bearing in 1828, and late writers claim that about thirty of these trees are still living, though all so gnarled and moss-grown as to be scarcely recognizable.

On April 4, 1824, the Spanish Mission of Sonoma was established, and in the fall following a small number of fruit trees and about three thousand grapevines were planted.

It was here that on June 14, 1846, thirty-three or thirty-four pioneers, under the leadership of Wm. B. Ide, captured the late General M. G. Vallejo and other officers of Governor Castro, raised "The Bear Flag," and made the first decisive declaration of independence from the government of Mexico.

At length in the progress of events the demand for lumber directed attention to the redwoods. Explorations were made and mills erected. The land was claimed under the laws of Congress; settlements were formed, and gradually farms productive of wheat, barley, oats, hay, and hops were cultivated. The potatoes of Humboldt and of Bodega became celebrated. Small herds of cattle prospered and dairies were made. A few sheep here and there grew into flocks numbered by the thousands.

Fruit-bearing trees of almost every variety were imported from Oregon, mostly as an experiment. They grew rapidly, and larger importations were made, until in a few years there was an over-supply of fruit for home consumption. The means of transportation were so unsatisfactory that but little effort was made to send the surplus abroad. Since, the attention to fruit growing has been regulated very much by the prospective building of railroads. The construction of the North Pacific through Sonoma County was immediately preceded by a general increased interest in every department of this industry. Large ranches were divided, and thousands of acres were planted in vineyards and orchards. Now this county ranks among the very first in the State in the quantity and excellence of its fruit products. The spirit of enterprise thus stimulated has spread over the district, and although the means of transportation are still very unsatisfactory in many places, there is an awakened interest in the study of every department of horticulture. Inquiry is abroad in regard to the character of soil and of climate best adapted to the highest development of certain varieties of the apple, of the peach, and of all deciduous fruits. Orchardists are increasingly careful in regard to the trees they plant, upon what stock they have been worked, and how they should be reset, cultivated, and pruned. They are also interested in the study of the appearance and habits of insect pests, of the different diseases to which fruit trees are exposed, and of their most efficient remedies.

Under this impetus many of the great grain fields in the valleys are rapidly giving place to orchards, and could a railroad be built through the central part of this district, establishing connection with the Oregon system of transportation, it would open a vast and fertile country to the horticulturist—a country peculiarly adapted to all kinds of fruit growing. This fact is clearly indicated in the great variety and excellent

quality of its indigenous fruits, among which are the strawberry, raspberry, thimbleberry, huckleberry, and blackberry. There are many varieties of wild grapes and of plums; there are cherries, crabapples, black walnuts, and chestnuts. It is a fact, also, that almost wherever the manzanita (little apple) is found some variety of the domesticated apple will grow.

All the domesticated fruits cultivated on the Pacific Coast succeed well in this district. Berries of every description grow vigorously and bear abundantly. There are fields of blackberries of five, ten, and fifteen acres of almost unequaled productiveness. This remark is true, also, of all the different varieties of plums and prunes, many hundreds of acres of which have been in full bearing for years, and the annual yield is a matter of surprise. Near the coast where the chilly winds of the ocean prevail the peach does not succeed, or succeeds indifferently in protected localities; inland, in genial soils, it attains its highest perfection. The apricot and nectarine are not cultivated extensively, but where tried do well. The pear grows with great vigor, produces large crops, and is highly esteemed for its excellent qualities for all purposes.

On damp and heavy soils, in low valleys, where from any cause the heat is great in midsummer, only exceptional varieties of the apple are a success, unless *effectually protected*. The Baldwin, Bellflower, Pear-mains, and trees of similar habits, may grow well, but the fruit will often sunburn, lose its flavor and size, and be altogether inferior. There are exceptions to this statement in localities where there are protecting hills and other counteracting agencies. Experience proves that apples, first class in all respects, of almost every variety, are more surely grown on kindly soils, at an elevation of from one thousand five hundred feet to about four thousand feet, provided the trees are carefully shielded from severe north winds, and are not too near peaks covered with extensive snow-banks, which chill the air and produce fatal frosts. The superiority of size, flavor, and keeping qualities of apples thus grown is abundantly proved.

In many respects this district is the home of the cherry. With reasonable care and cultivation the trees are vigorous and healthy and produce largely every year.

The quince grows well and bears well. The same remark is applicable to the Siberian crabapple, to the Japanese persimmon, to the Italian chestnut, to the almond, and to the English and American walnuts.

Orange groves are in successful bearing in the neighborhood of Sonoma and in the Los Guillicos Valley. Isolated and small collections of trees are doing well in Santa Rosa, about Healdsburg and Cloverdale. The palms do well in the same localities.

The fig has been cultivated to about the same extent as the orange, perhaps as far north as the valley of Eel River. There is scarcely a doubt that the Mission and other hardy varieties will, with proper care, do well in protected places in any part of this district.

The olive is grown in large orchards near Sonoma, Santa Rosa, Healdsburg, and other places. Many varieties are being tried, and thus far all grow with remarkable vigor, and where old enough, the trees have produced large crops. The climate and soil of the foothills and the lower ridges and mountains are peculiarly well adapted to the character and habits of this valuable tree. The oil produced for several years past has been pronounced of the very best quality, and has taken

prizes regularly at the various State and county fairs ever since it was placed upon the market. This promising industry should be greatly extended and will, at no remote day, become a permanent and successful source of revenue.

All varieties of the grape grow strongly everywhere, wherever there is soil sufficient to give the vines a foothold, and the moisture is not too great. Raisins cannot be cured well in the sun, owing to the general dampness of the atmosphere.

The insect pests and diseases common to the vines and fruit trees on the Pacific Coast are found to some extent in this district. It is earnestly hoped that their encroachments will be effectually resisted, and that they will eventually be utterly exterminated.

The physical characteristics of this district, briefly noticed in the early part of this discussion, establish the fact that its climate and soil are especially favorable to the production of vegetable life, or it could not have brought forth and sustained through unknown ages trees of such unrivaled magnitude, forests of such density and extent, with grasses, herbs, and flowers of such value and beauty.

Its horticultural capabilities are demonstrated, not only in the variety and excellence of its indigenous fruits, but in the vigorous growth and wonderful productiveness of all the domesticated kinds which have been tried. Encouraged by these facts, wherever there are practical facilities for transportation, individuals are renovating the older orchards and making new ones. Coöperative colonies have been formed, and are planting hundreds of acres with apples and other fruits. A company owning a vast extent of land has placed many thousands of acres in the neighborhood on the market, to be sold in small tracts, at from \$2 50 to \$7 50 per acre. All the principal may remain five or six years unpaid; the annual interest only is required. The purchaser signs an obligation to plant a given number of fruit trees every season, until a deed is obtained for the land. Under this arrangement one hundred and forty-seven thousand trees were planted one year ago, and one hundred and twenty thousand trees will be planted this season.

There is an inviting field and ample room for more than one hundred such companies in this district.

REPORT OF SOL. RUNYON,

Commissioner for the Sacramento District.

To the honorable State Board of Horticulture:

GENTLEMEN: I have the honor to herewith submit my report as Commissioner for the Sacramento District. This district comprises the counties of Sacramento, Yolo, Sutter, Tehama, Colusa, Butte, and Shasta, and, in most of these counties, the past season has been remarkably favorable. The output of fruit has been larger than usual, and prices, while not ruling so high as during the previous year, have been fair. Altogether, the fruit growers of this district have small cause for complaint.

One particularly favorable feature of our orchards, which I have observed in my journeys about the different counties under my care, is their increasing cleanliness and growing freedom from insect pests.

This has been brought about almost wholly through the efforts of the County Commissioners, who have been willingly seconded in their efforts by the individual fruit growers. The result of this united effort against pests and fungi diseases is visible in the whole district. The trees are particularly bright and clean, and, while we can scarcely hope to entirely eradicate the pests which cause us so much trouble, annoyance, and expense, we may at least hope, with continued union of action, to keep them below the injurious stage. In fighting pests, the remedies and means prescribed by the State Board of Horticulture have been generally availed of, and with most excellent results.

The fruit industry is *the* one great industry of this section, and that the care bestowed upon our orchards in keeping down the pests is profitable from a financial point of view, is amply proved by the fact of increased prices being obtained from the orchards which were properly sprayed and cared for.

One thing that has come to my attention is the steady decrease in the scale pest. This is noticeable over the whole of my district. In many orchards which were at one time badly infested, this pest has now almost wholly disappeared. Whether this is due to foreign agencies, or to persistent spraying, I am unable to say, but incline to the belief that it is largely due to continued efforts in fighting pests, and which are now showing good results in this as in other respects.

Butte County is rapidly assuming an important position as the orange center of the northern portion of the State, and the output of citrus fruit from this section in the past three years has proved what her capabilities are in this direction. An impetus to this branch of horticulture has been given by the citrus fairs which have been held at Sacramento, Oroville, Marysville, and Auburn, and at which the fact has been amply demonstrated that citrus fruits will grow, flourish, and prove a profitable crop in the central portion of the State. It is estimated that there are now planted, within fifteen miles of Oroville, 98,349 orange trees and 6,812 lemon trees, as shown by the following table:

PLACE.	Orange.	Lemon.
Half-mile of Court-house, Oroville	4,000	50
Vicinity of Oroville	20,816	1,581
Palermo	40,348	5,114
Thermalito	32,370	10
Wyandotte	815	57
Totals	98,349	6,812

As indicating the extent and profitableness of fruit growing in Butte County, I append the following statement from General Bidwell, of Chico:

"I am unable to furnish you with any data in regard to the fruit product or shipments from this county aside from that raised on my own ranch.

"During the season just passed I raised and gathered on Rancho Chico the following quantities of different varieties of fruit:

Blackberries	19,626 pounds.	Pears	113,178 pounds.
Cherries	145,201 pounds.	Almonds	148,044 pounds.
Apricots	285,815 pounds.	Nectarines	81,783 pounds.
Quinces	3,172 pounds.	Prunes	377,416 pounds.
Grapes	521,447 pounds.	Plums	461,542 pounds.
Apples	662,209 pounds.	Peaches	2,529,246 pounds.

"These were raised from about five hundred acres of bearing orchard. In addition thereto I have about seven hundred acres of young orchards not yet in bearing. Inasmuch as I sold my crop of fruit green to outside parties this year, I am unable to give you any statistics as to what proportion of it was dried and what proportion was shipped green."

Fruit growing in Colusa County really dates from 1884-85. A few trees had been planted prior to that time, as it happened, and, like Topsy, "they grew;" but about this period a few of the more enterprising people in Colusa began to plant orchards, and success has attended all of them. Indicating the growth of horticulture in this county in this short period, I append the statement of the Assessor as to the number of trees now planted there:

	Bearing.	Non-Bearing.
Apricot	13,372	11,925
Cherry	721	976
Fig	1,202	2,692
Olive	69	435
Peach	20,335	17,564
Pear	28,913	16,940
Prune (French)	12,538	60,108
Prune (other kinds)	1,240	3,374
Lemon	4	54
Orange	95	765
Almond	2,807	1,214
Walnut	1,212	2,671
	82,558	118,718
		82,558
Total		201,276

Since these figures were taken, L. F. Moulton has set out an orchard of three thousand orange trees on the east side of the river, a short distance from Colusa, and at the present writing they are doing well and give great promise for the future.

It will be observed in the above list that, in point of numbers, prunes lead, with peaches second, pears and apricots coming next in nearly equal numbers. Of prunes, there are seventy-two thousand six hundred and forty-six trees, or about six hundred acres. Assuming that these trees have all been planted on good soil and produce only fairly, their dried product will reach nearly two hundred carloads annually when in full bearing.

I have made some estimate of the output of dried fruit from this county for the present season, and find the same to be about as follows:

Dried apricots	50 tons.
Dried peaches	30 tons.
Dried prunes	75 tons.
Dried nectarines	3 tons.
Dried pears	3 tons.
Almonds	7 tons.

Colusa orchards are young and just beginning to bear, but at the present ruling prices for dried fruit her fruit crop this season, including that sold for canning, will net her nearly \$30,000. For a beginner this is a good showing, and gives promise that before long Colusa will take her proper stand among the first fruit counties of California.

Tehama County is also making rapid strides in the direction of horticulture, as is shown by the Assessor's statistics, giving the number of fruit trees now bearing and of young trees lately planted, which have not yet come into bearing, in this county:

	Bearing.	Non-Bear- ing.
Apricot	21,707	16,414
Cherry	2,391	2,672
Fig	2,426	8,614
Olive	80	6,615
Peach	177,373	42,988
Pear	10,425	24,151
Prune (French)	16,066	35,048
Prune (other kinds)	2,844	5,228
Lemon	5	151
Orange	72	1,022
Almond	2,876	25,256
Walnut	205	1,264
	236,470	169,423
Total		236,470
		405,893

That these figures are rather under than over the amount is probable, owing to the inadequate means furnished the Assessors of the State to acquire statistical information. As the matter of gathering statistics is left largely optional with the Assessor, in many counties it is entirely neglected, and in most but carelessly performed. I would add, however, that I believe that the work in the counties in this district has been as faithfully performed as in any in the State, but there is always room for questioning the accuracy of Assessors' statistics. Where they err, however, it is never on the side of exaggeration; they are not given for boom effect, and so usually fall below the true numbers.

Cone & Kimball, of Red Bluff, place the output of dried fruit from Tehama for the past year at one hundred and twenty-five carloads. Added to this are large amounts shipped green and disposed of to canners, which indicate that Tehama, too, is an important factor in the fruit-producing region of the Sacramento Valley.

Sutter County has long borne an enviable reputation for the quality of her fruit and fertility of her soil. A great deal of attention is now being paid to the prune, which here does remarkably well, the trees attaining large growth and coming into bearing early. The industry is a comparatively new one, but during the past season one hundred tons of prunes were packed, of which amount R. C. Kells put up thirty-five tons, S. J. Stabler twenty-five, T. B. Hull ten, the Bunce orchard fifteen, Robinson Brothers five, and C. Weeman ten. The soil here seems especially well adapted to the prune, as in fact to all fruits, while the heat of the summer and the assured freedom from rain or atmospheric moisture of any kind during the curing season, is very largely in favor of the success of the fruit drier.

The Assessor's report for 1891 gives the following number of trees in Sutter County:

	Bearing.	Non-Bear- ing.
Apricot	21,564	11,984
Cherry	1,779	1,576
Fig	1,089	5,672
Olive	67	1,545
Peach	53,002	37,194
Pear	13,615	29,346
Prune (French)	8,139	8,581
Prune (other kinds)	10,299	2,094
Lemon	27	325
Orange	353	3,144
Almond	11,359	15,687
Walnut	515	334
	121,808	117,432
		121,808
Total		239,240

Sutter has shipped a very large quantity of fruit in the past season. Through the Fruit Union alone one hundred and sixteen cars of green fruit were shipped East; besides this a large amount was shipped by private individuals, a great deal more found its way to San Francisco jobbers, while the largest quantity was dried or canned. Prices have ruled very fair, many of the growers having contracted their orchards early in the season to jobbers at prices which the later market proved very good. It has been demonstrated here that one acre in fruit will equal in its net returns ten acres in grain, and it is this fact that has given so large an impetus to the fruit industry of Sutter County. It is a safe estimate that over two thousand acres are now planted to fruits and vines in the vicinity of Yuba City, all tributary to the canneries of that place and Marysville. It is this industry that has started the county seat on the road to growth and prosperity, and is the main factor in keeping up and increasing the population of Sutter County.

It has been demonstrated beyond peradventure that the citrus family will flourish here, and the orange crop this season is a full one. A very large pack of raisins, dried fruit, and nuts is reported, and on the whole horticulture in Sutter County is in a flourishing and healthy condition. Raisins also do well, as in fact does any class of fruit which receives proper care and intelligent cultivation.

Yolo has in the past year made gigantic strides in the horticultural field. Large bodies of land have been planted to trees in the season of 1891. The Yolo Orchard Company, composed of D. M. Burns, E. J. DePue, C. H. Waterhouse, Sam Jones, A. T. Hatch, Frank McMullen, and C. S. Givens, was organized in the latter part of 1890 for the purpose of setting out four hundred acres in fruit near Woodland, and it is estimated that nearly one thousand acres of new land have been put to fruit in the Capay Valley. These facts are sufficient to prove the faith which those who know her best have in Yolo as a fruit section. The apricot here does especially well, and has proved a very remunerative crop in the past. But the most valuable crop, from the experience of the few engaged in the business, has proved to be the prune. The French prune grafted on the Myrobalan stock has netted as high, in some

instances, as \$500 and \$600 per acre, and a ten-acre prune orchard, when in full bearing, would not only make a good living for an industrious man, but would enable him to enlarge his bank account from year to year and even enjoy the luxuries of life. A great many acres will be planted to prunes, and many more would be planted if the young trees could be had. Oranges are proving a success, but there are but few trees so far in full bearing. Raisins do well, and the crop of the past year has been very large.

The fruit crop of Shasta County for the season of 1891 was much more than an average, there being a great deal more of all varieties raised in the county than during the previous year, and with the exception of apples, which were affected this year with moth, etc., the fruit was of the best quality.

Canneries and drying establishments have been established, and a great deal of canned and dried fruit was shipped from the county. Raisins were also shipped from the county by the carload. Oranges were raised in different parts of the county, but only enough for home consumption.

The reputation of Sacramento is national, and little need be added here; suffice it to say, that the fruit crop of the past season has not in the least lessened that reputation. For fully thirty miles along the east bank of the Sacramento River will be found a continuous growth of bearing trees and vines, which produce all kinds and varieties of fruit. That portion of the county is the principal source of supply required to meet the heavy demands from the East for her products. For excellence of flavor and keeping quality the Bartlett pears and peaches claim especial merit, for the invariable record of higher prices and better demand in all Eastern markets is invariably demonstrated in favor of those lines, as well as for other Sacramento County products. The daily output from the Sacramento River section necessitates the employment of five large steamers to move the product required to supply the shipping, canning, and drying trade. The view along the river is beautiful in the extreme, for the magnificent orchards, adorned with numerous palatial mansions, present a scene most suggestive of prosperity and comfort, which is strongly indicative of the beneficial results that are obtained from the influences surrounding the life of the energetic California farmer.

On the banks of the American River are many magnificent orchards and vineyards; one in particular, that of the Natoma Company, which is the second largest vineyard in the world, there being over three thousand acres in actual bearing. The annual production of wine from this vineyard is over five hundred thousand gallons.

The following table shows the importance of Sacramento as a center of the fruit business. Total shipments from January 1 to December 10, 1891:

Green fruits.....	55,201,231 pounds.
Dried fruits.....	13,303,680 pounds.
Canned goods.....	79,755,580 pounds.
Raisins.....	43,680,000 pounds.
Hops.....	4,066,370 pounds.
Wine.....	11,566,920 pounds.

Comparison with other counties the record of the shipments made from Sacramento City, the distributing point of the county, shows

that Sacramento County prominently leads in the heaviest production and shipment of green fruit, hops, and vegetables, over all counties of the State, the second heaviest in shipments of dried fruit and wine, and third in the proportion of canned goods.

A large amount of the fruit output of Sacramento was carried on the river boats, of which the "Thomas H. Dwyer" reports having carried two thousand and fifty tons of green fruit, and the master of the steamer "Apache" states that his fruit shipments from points on the Sacramento River during June, July, and August, 1890, amounted to two thousand six hundred and five tons. During the same period of 1891 they amounted to four thousand four hundred and sixty tons, an increase of one thousand eight hundred and fifty-five tons for the season.

The California Transportation Company furnishes the following statement of fruit, in tons, carried on their boats from Sacramento River points during the same period:

	1890.	1891.
Apples.....	373	663
Apricots.....	1,034	1,220
Berries.....	6	11
Cherries.....	12	32
Dried fruits.....	28	57
Figs.....	51	48
Grapes.....	580	573
Melons.....	3,078	2,120
Melons, nutmeg.....	137	180
Peaches.....	2,875	5,306
Pears.....	1,998	4,048
Plums.....	195	469
Prunes.....	41	117
Quinces.....	33	41
Tomatoes.....	961	1,100
Fruit to canneries.....	442	1,446
Totals.....	11,844	17,431

This table shows an increase of five thousand five hundred and eighty-seven tons over the amount carried in 1890, indicating clearly the increased production of the sections tapped by their steamers.

SUPPLEMENTARY
REPORT OF B. M. LELONG,
Secretary State Board of Horticulture, and Ex officio
Chief Horticultural Officer.

PART I.
THE FRUIT SEASON OF 1891.

REPORT OF B. M. LELONG,

Secretary, and Ex officio Chief Horticultural Officer.

CHAPTER I.

REVIEW OF THE FRUIT SEASON.

DEMAND AND PRICES.

The fruit season of 1891 has not been so profitable as was that of 1890. A fair average yield is reported from the various fruit sections of the State, but prices have been very much depressed and the demand light. This condition, immediately succeeding, as it did, the remarkably profitable season of 1890, seems the duller by contrast. Still, fair prices have ruled, and, while not doing so well as in the previous year, the fruit growers of California generally report having done fairly well.

Several causes have combined to depress prices. Last year there was keen competition among jobbers. Large stocks of fruits and raisins were purchased for a future demand, and when the demand came it was much lighter than had been anticipated by the jobbers, who lost heavily. Profiting by their experience last year they have gone to an extreme of caution in their purchases this season, and are handling very small stocks—only such quantities that they see an almost immediate demand for. No heavy stocks are being carried, and the fruit is largely left in the producers' hands.

A second cause for this depression is found in the unprecedentedly large fruit crop in the Eastern States. Last year's crop was almost a failure, and it was upon this fact that the jobbers speculated so heavily. This year the Eastern yield has been very large, resulting in a natural lessening of cost and an increased consumption. People on farms and in towns, who last year purchased California canned and dried fruits, have this year packed their own, and fruit preserving has been resorted to by millions of people there, thus shortening the demand for the California product. The Eastern trade journals report the demand for glass fruit jars so large that all the glass factories in the country have been unable to meet it. This has had its effect upon the jobbers in buying California fruit. They recognize the fact that the home product must be exhausted before there will be a large demand for the imported article.

That this depressed condition will continue is very improbable, but seasons of depression, brought about by extraneous causes, may be looked for in the fruit as in all other industries, and no human foresight or ingenuity can guard against them. Our fruit growers should not feel discouraged on this account, for, even with the depressed condition of the market, orchards which were properly attended to and the output of which was intelligently handled have paid.

In the years 1889 and 1890 there were imported into the United States foreign fruits, as follows:

ARTICLE.	1889.		1890.	
	Quantities—Pounds.	Value.	Quantities—Pounds.	Value.
Figs	9,101,300	\$395,833	9,678,315	\$710,924
Lemons		3,000,867		3,797,069
Oranges		1,974,861		2,069,061
Plums and prunes	43,717,353	1,235,391	61,905,782	2,819,420
Raisins	35,972,017	1,826,232	44,798,769	2,315,557
Preserved fruits		881,309		1,381,111
All other fruits		1,368,257		1,393,695
Almonds	5,454,489	712,187	7,497,193	989,866
All other nuts		649,521		1,340,094
Totals		\$12,044,458		\$16,816,897

These figures clearly indicate that there is a large and increasing home market for California fruits yet unfilled, and are encouraging, in view of the fear of overproduction which has possessed some of our fruit growers, owing to the low prices and comparatively small demand of the present season.

Despite the heavy demand for California fruits in 1890, there was an increased importation of foreign fruits into the United States of \$4,772,439 over the preceding year, and a total of \$16,816,897 was paid out in that year for foreign fruits, the greater part of which California should supply.

A review of the rapidly increasing demand for fruits in the past should permanently set at rest all fear of overproduction in the future. The home market of the United States cannot possibly be filled by California for years to come, and when, if ever, it is, there are still chances in the European and other markets of the world for our supplies.

Thirty years ago there were imported into the United States 300,000 boxes of citrus fruits. In 1889 Florida contributed, to supply the demand, 600,000 boxes, and California contributed 780,000 boxes. Thus the country into which thirty years ago were imported 300,000 boxes of citrus fruit, produced within its own borders 1,380,000 boxes. What were the facts as to importation in the same year? From the report of the Senate Finance Committee, compiled for the use of the Senate of the United States in the discussion of the McKinley bill, and gathered from the most authentic sources, to wit: the Custom-house returns of the United States, it is shown and declared that in 1889 there were imported into the United States of citrus fruits 3,354,963 boxes and 113,927 barrels. Thus, notwithstanding the contribution of Florida and California to the volume of supply, the importation of citrus fruits into the United States was more than eleven times that noted prior to the beginning of home production. The entire demand of the United States thirty years ago was imported. When this country becomes a producer to the extent of 1,380,000 boxes, the importation in the same time has arisen to nearly 4,000,000 boxes, thus constantly widening the margin in favor of the home producer and forever silencing all prophecies of overproduction. In 1880 we shipped 590,000 pounds of dried fruit, and the shipments of 1889 reach over 33,000,000 pounds, or sixty-five times the volume of the shipment of 1880. Thus we supplied to the markets of the East in 1889 sixty-five times the annual volume supplied nine years previous. Of

green fruit, the amount of shipments in 1880 was 5,180,000 pounds, and this had increased in 1889 to over 50,000,000 pounds, or ten times the amount shipped nine years before. Of citrus fruits, in 1882 we shipped 917,000 pounds, and in 1889, seven years later, the amount had increased to fully 20,000,000 pounds. In 1880 the shipment of raisins was less than 800,000 pounds, and in 1889 it had reached 18,000,000 pounds.

The rapid increase of population in the United States promises a steadily increasing demand for our fruit products, for fruit is not now, as it was in the earlier part of the century, an article of luxury—it has become a food necessity. Improved methods of preserving fruit, in canning, drying, and other ways, have enabled people of the present age to have this desirable article of diet fresh the year round, and to add to their tables each day as staple food an article which their ancestors knew only in its season as a luxury. The result of this has been that fruit is gradually but surely replacing flour and meat, and, as there is more of the former used per capita, there is less of the latter. We are becoming a fruit-eating nation. This has been largely aided, too, by cheap transportation, brought about by the building of railroads to every corner of the land, and making it possible to remove our fruits at reasonable prices to those sections where they cannot be produced.

Aside from the home market there is a large foreign demand for our fruits, and canned goods are shipped to various parts of the world from California. A few years since California imported nearly all her canned goods from the East, but now she supplies the markets of the Eastern States, Australia, and Europe with their fruits, the superiority and cheapness of the California article having forced it to the front in competition with all others.

The quantity of canned fruit shipped by rail from California, from 1872 to 1890, is as follows:

1872	182,000 pounds.	1882	25,163,190 pounds.
1873	678,580 pounds.	1883	26,397,700 pounds.
1874	457,290 pounds.	1884	21,695,740 pounds.
1875	759,040 pounds.	1885	28,949,380 pounds.
1876	1,529,910 pounds.	1886	30,656,710 pounds.
1877	1,731,530 pounds.	1887	56,009,130 pounds.
1878	1,700,930 pounds.	1888	39,231,340 pounds.
1879	3,111,680 pounds.	1889	37,083,725 pounds.
1880	6,707,650 pounds.	1890	41,992,640 pounds.
1881	18,768,200 pounds.		

The enormous quantity of fresh fruit consumed by the canners of this State shows the relative position of the canned goods industry in connection with fruit growing in California. The total amount of fresh fruit used by our canners during the season of 1888 was 3,500 carloads, or 70,000,000 pounds, and the pack of fruit and vegetables for that year was as follows:

	Cases.
Table fruits (2½-pound tins)	1,223,165
Table fruits (gallons)	13,145
Pie fruits (2½-pound tins)	31,580
Pie fruits (gallons)	46,840
Jams and jellies	31,270
Vegetables (including tomatoes)	181,000
Total pack (24 cans to the case)	1,527,000

The leading fruits for canning are apricots, peaches, and pears. There were canned in 1885: Apricots, 10,000; peaches, 70,000, and pears,

80,000 cases. This quantity was increased in 1886: Apricots, 210,000; peaches, 130,000, and pears, 110,000 cases. There was an increase therefore of 290,000 cases altogether in these fruits in 1886 over 1885. In 1888 the pack reached for apricots, 328,456; peaches, 363,476; pears, 161,863, and plums, 121,838 cases.

In view of these facts the fruit grower need have little dread of over-production. It is true that California is not the only fruit-producing State of the Union, but it is generally conceded to be the leading one. A greater variety of fruits are produced here at less cost for cultivation and attention than in the Eastern States; the yield is more certain and usually much larger, and our orchardists can rely upon larger returns for their outlay and labor. There are many varieties of fruit, too, which do well and pay handsomely in California which cannot be produced in most of the Eastern States, as the citrus and sub-tropical varieties. The climate of California is particularly favorable to the fruit industry, and the soil in most portions of the State possesses, in a large measure, all the qualities required by the growing plant and the matured tree. These are facts which give assurance to the future of the fruit industry as a permanent and profitable pursuit.

Another advantage which the California orchardist has over his brother in the East is the comparative freedom of our trees from insect pests and injurious diseases. It is true that our State is not wholly free from these, but it has never known them in their worst forms. The destructive curculio has never been found here; the black-knot and the yellows, which have wrought such havoc in large fruit areas of the East, have never yet been heard of in this State. The vigorous system of quarantining against the introduction of pests and diseases introduced and prosecuted by this Board, and in which it has been so ably aided by the various County Boards throughout the State, has so far secured to our orchardists immunity from their most destructive enemies, and gives them an almost absolute guarantee of protection in the future.

As indicating the rapid growth, great importance, and vast possibilities of the fruit industry of California, General N. P. Chipman presents the following tabulated statement of the exports of fruit for 1890 in comparison with the export of wheat for the same year:

Shipped by the Southern Pacific Company to December 31, 1890.

PLACE.	Dried Fruit—Pounds.	Deciduous Fruit—Pounds.	Citrus Fruit—Pounds.	Raisins—Pounds.	Canned Goods—Pounds.	Nuts—Pounds.
San Francisco.....	4,768,630	75,520	144,500	897,620	45,630,140	181,320
Oakland.....	856,020	1,871,930	-----	20,050	316,240	-----
Sacramento.....	8,275,920	46,865,220	-----	3,797,290	10,278,640	103,170
San José.....	13,962,210	12,185,020	-----	185,440	16,654,780	30,170
Stockton.....	8,534,350	5,040,634	-----	20,148,590	1,112,560	20,880
Marysville.....	2,131,770	992,510	-----	546,340	3,422,660	21,140
Los Angeles.....	2,256,060	1,053,290	-----	7,477,120	429,240	601,960
Colton.....	2,596,960	-----	10,801,850	1,345,860	2,106,970	16,290
Totals.....	43,377,910	68,084,124	18,444,320	27,370,430	80,121,950	1,574,400

Total by Southern Pacific Company:

Deciduous, pounds.....	220,528,814	Citrus, pounds.....	18,444,320
Deciduous, tons.....	110,264	Citrus, tons.....	9,222
Deciduous, carloads.....	11,026	Citrus, carloads.....	922

Shipped by the Santa Fe System to December 31, 1890.

PLACE.	Oranges—Pounds.	Dried Fruit—Pounds.	Raisins—Pounds.
All places.....	49,975,000	-----	-----
Los Angeles County.....	-----	10,038,360	250,000
Orange County.....	-----	2,400,000	25,000
San Bernardino County.....	-----	8,290,000	11,275,000
San Diego County.....	-----	490,911	2,200,000
Totals.....	49,975,000	21,217,271	13,750,000

Total by Santa Fe system:

Deciduous, pounds.....	34,967,271	Citrus, pounds.....	49,975,000
Deciduous, tons.....	17,483	Citrus, tons.....	24,987
Deciduous, carloads.....	1,748	Citrus, carloads.....	2,498

Summary.

Total carloads, all kinds, Southern Pacific Company.....	11,948
Total carloads, all kinds, Santa Fe system.....	4,246
Total pounds, all kinds, by both systems.....	323,915,465
Total carloads by both systems.....	16,194
Total cars for each day of the year.....	44
Total carloads shipped in 1880.....	546
Excess in 1890 over 1880.....	15,648

The total carloads of both systems during the year 1890 would make a solid train of cars one hundred and twenty-three miles long.

It is a significant fact that, while our wheat output has not materially increased from 1880 to 1890, our fruit output has increased more than thirty times, and is growing with great rapidity. While the showing here made still keeps California in the front rank of wheat-growing States, being third in rank, it demonstrates the great advantages of the State as a fruit-producing country. In 1880 our exports of fruit brought us, probably, about \$700,000, while they now amount to about \$20,000,000. This wonderful result has brought with it what is above all computation, to wit: the demonstration that fruit growing in this State is very profitable, and is almost absolutely safe from frosts and other drawbacks, and has practically no limit. Ten years have taught us, also, that we may resort to lands for fruit growing, and quadruple our present output, and still retain our primacy as a wheat and barley and wool-producing State.

Another promising sign is the gradual decreased importation of many foreign fruits into the United States, and the increased output of the domestic product. Illustrating this is the fact that the importation of foreign raisins, which in 1887 amounted to 40,673,288 pounds, valued at \$2,281,981, had decreased in 1890 to 36,914,330 pounds, valued at \$1,997,103, while the crop of California raisins increased, during the same period, from 16,000,000 pounds to 30,000,000 pounds.

The favor with which California fruits are received in the East, and their growing popularity, are proved by the numerous complimentary allusions in the press to our fruit products in both their green and preserved state. The New York "Tribune," under the caption of "A Wonderland of Fair Fruits," pays a glowing tribute to this great California industry in the following language:

When California first joined Uncle Sam's army of States, bringing a dowry of gold and adding another atmosphere to her domain, it was little suspected how vast a reservoir of table needs and luxuries was concealed in her prolific soil. Wines and other

articles, once only to be seen in foreign invoices, have now a quoted commercial place as a domestic produce. The raisins of Spain now have a wholesale companion pouring in from the Pacific Coast, while the rich prunes of France must soon give way to a portion of her reputation, which she has held in the lead for centuries, since the introduction of our own from the golden shores. Heavy losses attended a host of experiments and ventures, but intelligent enthusiasm, supported by a generous outlay of capital, has prosperously rewarded the efforts of daring enterprise.

It also says:

California has the largest raisin-packing establishment in the world, and her prunes are seeking a wholesale place. The fancy grocers and confectioners are becoming less dependent on the glace fruits of Europe. They were formerly an expensive article in an afternoon's tea-spread, and within the reach of comparatively few buyers. California houses are boxing delicious home-grown material with a delicate taste, fine color, and a showiness of style that is turning attention to the American fruits, especially as the prices at retail are 25 per cent less than those for foreign grades. California grapes have an indisputable hold upon the favor of consumers. Some of the leading winemakers abroad have predicted that California, in the near future, can supply the red wine of the world.

The export of fruit from the shipping centers of the State, for the year 1891, over the Southern Pacific system, is given in the following table:

SHIPPING POINT.	Deciduous Fruit—Pounds.	Dried Fruit—Pounds.	Citrus Fruit—Pounds.	Raisins—Pounds.
San Francisco.....	118,000	6,476,000	68,000	1,052,000
Sacramento.....	55,542,000	14,334,000	10,000	4,402,000
San José.....	12,452,000	24,370,000		192,000
Los Angeles.....	1,556,000	856,000	15,982,000	826,000
Stockton.....	5,630,000	5,284,000		29,398,000
Marysville.....	2,138,000	4,616,000	20,000	396,000
Colton.....		1,022,000	14,976,000	1,046,000
Oakland.....	1,388,000	588,000		44,000
Totals.....	78,824,000	57,646,000	31,006,000	37,356,000

This table shows an increase for 1891 over those of 1890 of 11,695,440 pounds in deciduous fruits, 5,771,020 in dried fruits, 12,561,680 in citrus fruits, and 11,708,380 in raisins.

The overland shipments of canned goods, via the Southern Pacific Railroad, for the first nine months of the year, were as follows, in pounds: From San Francisco, 14,364,570; Oakland, 1,011,870; Sacramento, 4,886,630; San José, 7,070,770; Stockton, 1,043,070; Marysville, 1,441,440; Los Angeles, 493,520; Colton, 376,140; total, 30,688,010. Fully 90 per cent of the above was canned fruit, the remainder being canned vegetables.

The total overland shipments, via the Southern Pacific Railroad, of fresh, dried, and canned fruits, aggregate, in round numbers, 74,000 tons for the first nine months of the year.

The Southern California Railway Company shipped over its lines, for the year 1891, fruit as follows:

	Pounds.
Oranges.....	57,435,000
Lemons.....	378,000
Raisins.....	10,374,000
Dried fruits.....	11,544,000
Other fruits and vegetables.....	41,360,000
Total.....	121,091,000

East-bound shipments of fruit from Los Angeles, via the Southern Pacific, for the year 1891, are reported as follows:

	Pounds.
Citrus fruits.....	36,623,290
Dried fruits.....	1,841,860
Deciduous fruit, green.....	1,637,460
Raisins.....	2,029,070
Canned goods.....	1,550,670
Nuts.....	1,010,310
Total.....	44,692,660

Besides fruit moved from the interior counties by the Southern Pacific Company, large quantities found their way to San Francisco by steamboats from points on the Sacramento River. Of these amounts, the "Thomas H. Dwyer" reports having carried 2,050 tons of green fruit, and the master of the steamer "Apache" states that his fruit shipments from points on the Sacramento River, during June, July, and August, 1890, amounted to 2,605 tons. During the same period of 1891, they amounted to 4,460 tons, an increase of 1,855 tons for the season.

The California Transportation Company furnishes the following statement of fruit, in tons, carried on their boats from Sacramento River points during the same period:

KIND.	1890.	1891.
Apples.....	373	663
Apricots.....	1,034	1,220
Berries.....	6	11
Cherries.....	12	32
Dried fruit.....	23	57
Figs.....	51	48
Grapes.....	580	573
Melons.....	3,078	2,120
Melons, nutmeg.....	137	180
Peaches.....	2,875	5,306
Pears.....	1,998	4,048
Plums.....	195	469
Prunes.....	41	117
Quinces.....	33	41
Tomatoes.....	961	1,100
Fruit to canneries.....	442	1,446
Totals.....	11,844	17,431

This table also shows an increase of 5,587 tons over the amount carried in 1890, indicating clearly the increased production of the sections tapped by these steamers.

The Oregon Development Company shipped by steamer from San Francisco during the year 1891, fruit as follows:

SHIPPED TO—	Dried Fruit—Pounds.	Deciduous Fruit—Pounds.	Citrus Fruit—Pounds.	Raisins—Pounds.	Canned Goods—Pounds.	Nuts—Pounds.
Albany.....	3,400	10,535	38,680	3,030	21,185	7,710
Corvallis.....	815	16,138	22,402	1,185	5,735	3,450
Yaquina.....	3,055	29,320	12,101	1,025	8,870	2,035
Other points.....	9,830	5,265	17,114	5,315	24,215	7,751
Totals.....	17,100	61,258	90,297	10,555	60,005	20,946

Imports of fruit by the same company consisted principally of apples from Oregon, of which 70,334 pounds were brought to San Francisco by them during the year.

There were received in San Francisco from various points on the North Pacific Coast Railroad 1,431,730 pounds of deciduous fruits during the year 1891, all of which were consigned to jobbers in this city.

IMPORTS BY SEA.

The following table shows the importation of foreign fruits and nuts, as reported by the San Francisco Custom-house, for the year 1891:

MONTH.	Lemons—Value.	Oranges—Value.	Preserved Fruits—Value.	All other Fruits—Value.
January	\$695 00	\$3,724 00	\$2,576 00	\$2,401 00
February	695 00	476 00	1,604 00	2,405 00
March	276 00	276 00	2,035 00	2,687 00
April	39 00	39 00	1,493 00	5,736 00
May	2,542 00	2,542 00	2,142 00	7,484 00
June	837 00	2,240 00	2,240 00	7,902 00
July	97 00	708 00	708 00	6,210 00
August	93 00	11 00	4,542 00	4,507 00
September	3,360 00	3,360 00	3,360 00	3,725 00
October	1,192 00	8,771 00	8,771 00	7,368 00
November	4,322 00	6,546 00	6,546 00	2,989 00
December	10 00	2,811 00	2,911 00	3,201 00
Totals	\$2,427 00	\$15,393 00	\$38,923 00	\$55,615 00

MONTH.	Almonds.		All other Nuts—Value.
	Pounds.	Value.	
January	1,904	\$143 00	\$2,469 00
February	747	56 00	1,596 00
March	2,438	369 00	3,105 00
April	2,818	561 00	448 00
May	1,209	105 00	151 00
June	3,724	498 00	207 00
July	3,057	586 00	68 00
August	1,160	139 00	344 00
September	4,698	1,071 00	640 00
October	340	27 00	17,527 00
November	4,091	630 00	807 00
December	2,697	416 00	8,602 00
Totals	28,883	\$4,601 00	\$35,964 00

In July there were imported 2,016 pounds of prunes, valued at \$81; in September, 550 pounds, valued at \$69; in December, 1,320 pounds, valued at \$155, and in October, 2,352 pounds of raisins, valued at \$158; making a total value of all fruits and nuts imported by sea to San Francisco for the ten months named of \$119,986. Of the amount \$55,615 expended for unclassified fruits, the greater portion was for Mexican limes.

EXPORTS BY SEA.

The following table shows the exports by sea of fruit and nuts from San Francisco for the year 1891, from the Custom-house returns:

MONTH.	Apples.		Canned Fruit —Value.	All other Fruits, Green, Ripe, and Dried—Value.	Nuts—Value.
	Barrels.	Value.			
January	812	\$2,099 00	\$12,918 00	\$662 00	\$902 00
February	434	1,251 00	22,323 00	322 00	546 00
March	93	240 00	18,842 00	544 00	334 00
April	18	75 00	76,037 00	608 00	520 00
May	11,090 00	2,298 00	11,090 00	2,298 00	642 00
June	10,569 00	2,231 00	10,569 00	2,231 00	337 00
July	224	617 00	22,945 00	1,720 00	525 00
August	1,611	4,572 00	116,691 00	2,235 00	716 00
September	3,869	11,114 00	372,052 00	1,411 00	380 00
October	5,063	13,617 00	190,721 00	2,020 00	1,028 00
November	2,989	7,609 00	152,980 00	1,239 00	1,492 00
December	1,074	2,530 00	46,864 00	848 00	1,237 00
Totals	16,187	\$43,724 00	\$1,054,032 00	\$16,156 00	\$8,659 00

The California Fruit Union, which controls a large part of the output of deciduous fruits of the State, reports its shipments for 1891 at 1,387 carloads, a slight increase over the shipments of the preceding year, and a very encouraging increase upon 1888 and 1889. The following table gives the number of carloads contributed by various points for the past four years:

	1891.	1890.	1889.	1888.
Vacaville	278	254	171	163
Loomis	22	6	—	—
Newcastle	83	138	38	33
San Francisco	2	2	—	—
San José	304	290	206	97
Winters	102	109	28	25
Sacramento	294	196	278	346
Santa Barbara	5	2	—	—
Marysville	—	3	—	6
Mullen's Switch	—	3	—	—
Chico	3	1	—	—
Shellville	—	1	18	—
Suisun	65	68	47	11
Fresno	2	2	—	15
Davisville	12	26	22	24
Martinez	1	10	9	—
Fowler	6	9	—	—
Tulare	22	25	—	—
San Lorenzo	30	28	58	33
Florin	50	59	32	—
Colfax	—	4	4	12
Malaga	—	3	—	—
Natoma	25	56	52	29
Elk Grove	—	1	5	—
Bakersfield	—	24	—	—
Sonoma	17	25	—	—
Wrights	13	11	—	10
Haywards	8	1	—	—
Cordelia	—	5	—	11
Manlove's Switch	—	10	—	—
Pleasanton	1	1	—	—
Blacks	—	—	1	—
Napa	—	—	5	—
Penryn	—	—	4	7
Mayhews	—	—	11	17
Santa Rosa	—	—	—	6
Woodland	—	—	—	2
Carried forward	1,343	1,373	989	848

	1891.	1890.	1889.	1888.
Brought forward.....	1,343	1,373	989	848
Concord.....	17			
Hueneme.....	14			
Armona.....	3			
Biggs.....	2			
Hanford.....	2			
Yuba City.....	2			
Buhach.....	2			
Lodi.....	1			
Sequel.....	1			
Total number of carloads for season.....	1,387	1,373	989	848

Of this year's shipment Chicago received 654 carloads; New York, 258; Minneapolis, 111; Omaha, 94; St. Paul, 54; Boston, 87; New Orleans, 55; St. Louis, 44; Kansas City, 20; Louisville, 9, and Buffalo, 1.

The cherry shipments were much larger than in any previous year, and the results were generally very satisfactory. The shipment of Bartlett pears was very heavy, and they generally arrived in good condition, but prices ruled very low and unsatisfactory on account of meeting with competition from Eastern Bartletts. The shipment of peaches was not very large and prices generally low, owing to the large crop of peaches raised in the East, and also to the fact of their crop being early, while ours was correspondingly late. The grape shipment was heavy, and compared fairly with other years in prices realized.

The first car shipped left Vacaville May 13th, the last car from San José December 3d, making a season of six months and nineteen days from first to last.

CHAPTER II.

CONDITION OF FRUIT IN CALIFORNIA.

CITRUS FRUITS.

The citrus crop of the State for 1890-91 was much in excess of that of any preceding season, but the demand for the fruit in the East did not appear to lessen on this account, and good prices were received by the growers. A glut of some of the earlier Navel oranges was reported from Riverside, due to inability to handle the large output of fruit rather than to any lack of demand for it. Interest in this branch of horticulture has not waned in the least, but seems to move with increased velocity, and, especially in the southern counties, vast areas of new land are continually being planted to citrus fruits. The great profits of this industry have attracted the attention of Eastern and local capitalists, and companies for the culture of citrus fruits on a large scale have been organized, and other companies, having in view the husbandry of water and reclamation of arid lands for citrus culture, have also been formed, all of which gives promise of a vast increase in citrus culture during the next few years. Outside of the southern counties attention is being directed to orange and lemon culture, and in many cases with remarkably good results. Good reports are made from Butte, Yuba, Placer, and other counties where citrus culture is attaining a strong hold.

The cultivation of the lemon seems to be growing in favor, and more attention to this fruit is now being paid than ever before. There are many portions of the State especially adapted to its culture, and it has been found a very profitable fruit. The difficulty heretofore experienced in handling and shipping has been overcome, through the publication by this Board of the method of G. W. Garcelon, of Riverside, who has met with such great success in this branch of the citrus industry.

The following table will show the importance of citrus culture in this State, and also indicates its rapid growth. The figures given are for the southern counties, where the great bulk of the fruit is produced. It is estimated that ten carloads will cover all that is exported as yet from other counties:

Shipments of Citrus Fruits.

COUNTIES.	1890.		1891.	
	Boxes.	Cars.	Boxes.	Cars.
Los Angeles.....	198,695	781	632,071	2,212
San Bernardino.....	487,000	1,705	487,882	1,708
Orange.....	112,190	307	147,332	516
Ventura.....	9,460	33	19,475	68
San Diego.....	6,600	23	18,861	66
Santa Barbara.....			6,478	23
Totals.....	813,945	2,849	1,312,099	4,593

This table includes shipments of both oranges and lemons; of the latter fruit there were 20,904 boxes shipped, which would make a total of 702 carloads.

The work done by the *Vedalia cardinalis* in this State cannot be better illustrated than by the reported shipments of citrus fruits from Los Angeles before and after its introduction. For years Los Angeles was the leading shipper of citrus fruits, but the introduction and spread of the cottony cushion scale so affected the industry that it was on the verge of extinction. In 1890 San Bernardino County, into which the cottony cushion scale had not forced its way, shipped 1,705 carloads of oranges, and Los Angeles 781 carloads. The *Vedalia* was at work, however, and the returns of 1891 were 2,212 carloads for Los Angeles and 1,708 for San Bernardino, an increase of three carloads for the latter county, while Los Angeles sprung in one season from 781 to 2,212, an increase of 1,431 carloads. The increase of San Bernardino was a natural one, but that of Los Angeles was due to other causes than the coming in of new orchards.

The season of 1891-92 opened very auspiciously for the orange growers. The trees were particularly thrifty, the fruit set in large quantities, and the indications promised a very large yield. On December 10-11, however, a severe wind visited a large portion of the citrus section, sweeping through the San Gabriel Valley, reaching Pomona, Ontario, Riverside, and other portions of Los Angeles and San Bernardino Counties, and doing a vast amount of damage. At Pasadena and San Gabriel, where the wind was especially severe, it was estimated that one third of the fruit was blown from the trees, and a large part of the remainder was injured to a greater or less degree. Following this, on the night of December 25th, was one of the severest frosts ever known in the Riverside section, where for over ten hours the temperature was below the freezing point, the mercury ranging from 21 to 28 degrees above. What the exact amount of damage is it is impossible to tell until the returns from the crop are in, but experts figure it at from one third to one half.

THE APPLE.

It has come to be accepted as a fact that in the lower lands of the interior valleys the apple is not a profitable crop. In some localities especially adapted to its growth, along the river bottoms, or on cold, damp land, some varieties will yield good results, but the fruit grown here is not usually fine flavored, or possessed of good keeping qualities. While this is true of this portion of the State, there is a vast area of territory upon which the apple does phenomenally well. In many of the coast counties, where the temperature is not too high, in the foothills of the Sierra and the Coast Range, and in the higher mountain counties, the apple is the standard fruit crop, and the fruit produced here surpasses in size and quality that of the apple sections of the East. To those who have good apple lands adjacent to means of transportation to the centers of demand, the apple has proved a remarkably profitable crop.

The fact that the apple was first planted in the valley lands where soil, climate, seasons, and other conditions were so different from its natural requirements, caused it to yield indifferent returns, and it became accepted as a fact that the apple would not do well in California.

Later experiments, under more favorable conditions, have disproved this, but there still exists in many minds the old prejudice, generated by early failures, against apple growing for profit. This prejudice, however, is gradually giving way, as it is being demonstrated that California apples, properly cultivated and grown under favorable conditions, are superior to the Eastern product in size, keeping and drying qualities, and profitable yield, and in many of our coast and mountain counties, and in the higher altitudes of the interior valleys, apple growing is rapidly assuming its proper place as a profitable industry.

The northwestern part of the State, from the lowlands along the coast to an altitude of near four thousand feet in the Coast Range, has proved itself to be especially adapted to apple culture. The tree here grows very strong, and the fruit is all that can be desired. Humboldt and Siskiyou apples have a well-merited reputation for size and quality in the San Francisco market, and are known over the whole State for their superiority. Last season one hundred and forty-two carloads of apples were shipped from Siskiyou County to the East, mostly to Chicago, New York, and Boston, where they were the favorite in competition with the choicest Eastern fruits. They were shipped in forty-five-pound boxes, and kept perfectly well, arriving at their destination in excellent condition. The favorite varieties in this section are the Yellow Newtown Pippin, Wine Sap, Spitzenberg, Northern Spy, White Winter Pearmain, and Baldwin.

In the northern part of the State, along the course of the Smith, Klamath, Trinity, Mad, and Eel Rivers, are grown as handsome and finely flavored apples as can be found in the United States. Many varieties of late keepers retain their flavor and keep sound as late as July and August.

Excellent apples are also produced in the counties on the eastern slope of the Sierras, and some of the older orchards in Lassen County are reported as paying remarkably well. In Shasta, Tehama, Butte, and other counties of the Sacramento Valley, favored localities are found especially adapted to the growth of the apple where it has proved a very valuable and profitable crop. Nevada County reports three thousand seven hundred acres in apples, which this year yielded more than the average crop, and found a ready sale at fair prices.

The apple does well in Mariposa County, and an orchard of some one thousand five hundred trees in the Yosemite Valley, planted by its first pioneer, James Lannon, has yielded good results. The apples from this orchard are large and beautiful, but the soil being granitic in character, with an absence of clay, the flavor of the fruit is not equal to that produced in some other sections.

In the foothills and mountains of Fresno Flat, at an altitude of from one thousand nine hundred to four thousand feet, can be grown as fine apples as can be desired. A variety which prospers above all others in this region is the Yellow Newtown Pippin, which does not shrink, keeps in perfect condition until the first of July, and always commands a good price.

There is no region in the world better adapted for raising apples than the foothills and mountain regions and the numerous little valleys embraced therein. There are many thousands of acres of virgin land in the mountains along the east side of the San Joaquin Valley where the apple can be grown to the greatest perfection. In Fresno County, at the

base of the Sierra Nevada range, at an elevation of four thousand feet, Mr. Todd has fifteen acres in young apple trees. Some of these at five years of age bore last year four hundred and fifty pounds of fruit to the tree. The fruit possessed excellent keeping qualities, and was disposed of in the spring at 6½ cents per pound to local dealers.

The apple crop of Santa Cruz County in 1890 yielded two hundred and fifty thousand fifty-pound boxes, which sold for \$123,000, and the returns for the present season give promise of even better results.

In the foothills and higher table-lands of the Sierras, in Tulare and Kern Counties, apples remarkable for beauty of appearance, flavor, size, and keeping qualities are produced, and these qualities are found in all the apples grown in the Sierra foothills and cañons.

Very good apples are also grown in portions of the extreme southern end of the State. In speaking of the apples grown there, Mr. Earl, of the Earl Fruit Packing Company, says: "The apples grown here are very fine of their kind. We have bought a quantity of the red winter varieties (Wine Sap and Spitzenberg) for shipment to Australia and Japan. The finest Southern California apples are the Bellflower and White Winter Pearmain. Some of the apples from the mountains of San Bernardino are especially fine."

One of the oldest and most successful apple orchards in the State is that of Senator F. C. De Long, of Marin County. It covers one hundred and fifty acres, a large part of which has been in bearing since the latter part of the fifties. The prevailing varieties are the Yellow Newtown Pippin, White Winter Pearmain, Spitzenberg, Wine Sap, Roxbury, and Baldwin. During the past season the orchard did more than usually well, although it was found necessary to keep up a constant warfare on the codlin moth and canker worm. The larger portion of the fruit from this orchard is shipped to Australia, where it finds a ready sale. The apples are carefully selected, and packed with care; each one is examined to see that it is perfect, and is then wrapped in paper. They are then packed in boxes, forty pounds to the box, and loaded on the steamer. The past season Mr. De Long's fruit netted him \$1 65 per box on the wharf, and out of one thousand boxes shipped by him but sixty were reported as not having reached their destination in first class condition. The culls and poorer specimens are used for cider and vinegar.

Among the more favored late varieties are the Yellow Newtown Pippin, Yellow Bellflower, White Winter Pearmain, Ben Davis, Rhode Island Greening, Esopus, Spitzenberg, Jonathan, and Baldwin, all of which possess good qualities. The favorite early varieties include the Caroline, Red June, Early Harvest, Red Astrachan, Gravenstein, Fall Pippin, and King of Tompkins County. Of the latter a very excellent illustration is given herewith. The fruit is large, globular, angular, inclining to conic, yellowish, mostly shaded with red, striped and splashed with crimson; stalk short and stout, in large, somewhat irregular cavity; calyx small, closed; flesh yellowish, rich, juicy, vinous, aromatic.

Owing to the fact that apple culture and curing have received less attention than has the culture of many other fruits in the State, it is difficult to obtain accurate data as to the output of the crop or the profit attached to it, but there are many growers who have good apple lands who make the statement that they consider apple growing under favorable conditions as remunerative as orange growing.

Dried fruit this year has brought from 6½ to 7½ cents for pound lots of

good to choice evaporated, in boxes; 4 to 4½ cents for ordinary sliced in sacks, and 3½ to 4 cents for common quartered.

The apple is king among fruits, and as such demands our best efforts for its preservation and improvement. While the apple is preëminently the king of all fruits, and the tree is among the most hardy, vigorous, productive, and widely disseminated of all our large fruits, it is not without its enemies and diseases.

There are insects, parasitic and others, that prey upon it, and various fungi that feed upon the foliage and fruit. The twig borer, though not common, sometimes affects our apple trees. The most destructive enemy of the fruit, if neglected, is the codlin moth, but the ravages of this pest can be easily checked if proper measures are taken. A thorough spraying of the tree twice during the period of the setting of the young fruit will be sufficient to destroy the pest and insure the perfection of 75 per cent, or even more, of the crop.

D. M. Locke, Secretary of the Santa Cruz County Board of Horticultural Commissioners, has issued an excellent address to the fruit growers of his county, in relation to the care of apples, from which the following is taken:

"Good bands of double thickness of burlap, say at least six inches wide, should be placed around every bearing tree, and well looked after every week as long as fruit is upon the tree.

"All apples, as soon as gathered, should be removed to some distance (not yet fully determined) from the orchard, or deposited in a moth-tight apple-house, for they are all infested with the eggs of the moth, that will continue to hatch out, and the larvæ will take shelter in the boxes and shelves, in the floors and ceilings of the apple-house, until spring brings a new crop of apples; then the fertile moth comes forth at night and seers to it that every one of these tiny apples has at least one egg. Now, if the apple-house had been air-tight, they could all have been destroyed there. Some apple growers have these houses now, and others must provide them. They are neither difficult nor costly of construction.

"The ground is a good enough floor for this purpose, and the walls and ceilings may be covered with board paper or matched stuff, or lathed and plastered, and the ventilators secured with wire cloth.

"In these moth-tight rooms we have learned another lesson in the habits of the codlin moth. We find that the larvæ from the previous year's apple crop continue to hatch out moths, not only all summer, but into the fall. If in here, why not in other places where the environment to them is the same? So it seems certain that the codlin moth will survive the entire loss of one year's fruit crop and be on hand for the next."

The woolly aphis is a common pest, and is easily subdued by the application of gas lime for the root form and rosin spray for the branch form. There are also now several ladybugs that have been discovered feeding upon this aphis, and others are now being introduced from Australia, which are said to rid an orchard of aphis in a very short time.

THE APRICOT.

In no State in the Union does the apricot flourish so well or yield such early and large returns as it does in the greater portion of California. In a few of the extreme northern and eastern sections, regions of

high altitude subject to late frosts, the apricot cannot be relied upon as a profitable crop, but in the greater portion of the coast counties it is a favorite orchard tree. For the past season good crops and good prices are reported. The dried product has held very steady, with decidedly limited offerings of good to choice quality at $8\frac{1}{2}$ to $9\frac{1}{2}$ cents for the better grade in boxes, and $6\frac{1}{2}$ to 8 cents for fair and choice in sacks. The ordinary sun-dried fruit sold at $3\frac{1}{2}$ to 6 cents per pound.

In preparing the apricot for market, the fruit should be thoroughly ripe before gathering, and should be handled carefully in packing or carrying to the drying ground. After the pits are removed the halves are arranged on trays, the cut side up, and then put in the sulphuring box to close the pores and cause the fruit to retain all its fresh and desirable qualities in evaporating or drying.

In the "American Agriculturist," Ninetta Eames gives an excellent account of the apricot in Ventura County:

"In the cultivation of most fruits California is forced to compete with various portions of the United States, but for all practical purposes apricot growers have the entire world for a market. The climate and soil of many parts of California are peculiarly advantageous for bringing this luscious fruit to its highest perfection. The trees rapidly attain a luxuriant growth, and require vigorous annual pruning and watchful care to prevent the branches from breaking with the weight of fruit. Especially is this true in locations where the soil is a deep, rich loam and well drained. The pits sprout easily, and the young trees are ready for budding in June or July. The peach root is largely used for the apricot, though various other stocks are successfully employed, thus giving it a wide adaptability to different soils. Fruit growers are beginning to realize that the demand for this fruit is far in excess of its present production, and that any possible increase for years to come is not likely to exceed a profitable limit. It is necessary to use greater caution in the selection of a site for an apricot orchard than for the culture of other California fruits. In orchards near the coast the apricot 'points its best branches to the ocean, and the landward limbs and twigs bend up and endeavor to reach in the same direction. This is patent in every tree, and in the long rows is very striking.' This cannot spring from an inherent partiality to the sea, for the apricot is known to do equally well in land-locked valleys and foothills, where it is sure to ripen earlier. Coast apricots, on the contrary, are late coming to market, but the skin and pulp have a richer color than the same varieties produced in the interior. As the bulk of the crop is usually dried before shipment, it will be readily seen that a situation near the sea has the grave drawback of too much moisture in the atmosphere. Machine drying has not proved as satisfactory or as cheap as sun drying, and the latter method is in more general use.

"The immense quantities of apricots raised in coast counties are shipped to the interior to be dried in the open air. The largest drying floor in the State used exclusively for apricots is at Newhall, a beautiful little town set amidst sunny grain levels, everywhere dotted with the greenest of live oaks. The air here has the hot, dewless quality belonging to the inland mountains of California, and fruit exposed to it will dry with astonishing rapidity. Last year the orchardists of Ventura sent two hundred and seventy-five carloads of their apricots to the drying yards at Newhall, a distance of fifty miles. They were paid

\$200 a carload by the drying firm. The firm were at the additional expense of freight, pitting, and drying, making a total cost to them of 8 cents per pound. They sold the product for 13 cents, leaving as their profit 5 cents per pound. The apricots arrive at Newhall at the rate of seven carloads a day, and several hundreds of persons, old and young, are employed at the drying-sheds during the season, which lasts from six weeks to two months. Within fifty-six hours from their shipment at Ventura the apricots have been handled, dried, packed, and placed aboard cars bound for the Eastern market.

"A recently invented pitting machine bids fair to do away altogether with old-fashioned methods of preparing fruit for drying. Within the space of ten seconds there are fifteen revolutions of its wheel, and at each revolution four apricots are cut in half. At this rate three hundred and sixty apricots are pitted in one minute. It is estimated that the machine will pit four tons of fruit in a day, thus doing the work usually accomplished by eighteen men. Before spreading the cut fruit on the trays to dry, it is first subjected to the fumes of sulphur, to set the color and prevent oxidation. Care is taken to avoid over-sulphuring. Twenty to thirty minutes is considered sufficient, the riper fruit requiring the shorter time.

"In 1889 the first carload of apricots sent to New York sold for 21 cents per pound within half an hour after its arrival. In that year Southern California alone reaped a harvest of \$280,000 from this fruit. Last year's shipment of canned apricots reached as high as half a million cases. Of all the fruits canned in California the apricot is the favorite in the New York and Chicago markets. Though large quantities of fresh apricots have been sent East, this method of disposal is not in favor, owing to their liability of damage.

"Unlike many other varieties of fruit the apricot is inclined to wilt and become leathery if picked before fully ripe, and consequently is greatly deteriorated when it reaches its destination.

"Among the various varieties of apricots tested the Royal is probably the most popular kind grown in California, though the Hemskirke, Blenheim, and Moorpark are also favorites. The latter has an orange skin, freckled with numerous dark specks, and is delicious in flavor. Like the Royal, it is excellent for both canning and drying, and is a prolific bearer, upward of one thousand pounds being frequently gathered from a single tree. The Royal is an earlier apricot, and of lighter color than the Moorpark. Its velvety, yellow skin is tinged with a faint carmine on the cheek next the sun, and when not allowed to overbear, it is justly estimated as one of the handsomest varieties grown.

"Thorough cultivation is essential to the best results from an apricot orchard. If the soil is worked perseveringly, irrigation will be usually found unnecessary. Wherever the apricot thrives peaches also do well, though not all lands that produce the peach are adapted to apricot culture. The two fruits make an advantageous combination as regards the disposition of the crops. The better varieties of peaches do not appear until after the apricot season is past. This makes it possible for the small orchardist to handle both crops with little or no hired help, while the same methods are equally available in the management of the peach.

"In the early summer, after the pink flush of blossoms is blown from the leafless branches, an apricot orchard has a renewal of beauty that

only terminates with its full fruition of 'apples of gold.' The tops of the trees are feathered with innumerable young branches of delicate shades of red, which are in exquisite contrast to the poplar green of the lower leaves. This effect remains all during the formation of the growing fruit and far into midsummer, when the bee-haunted orchard is odorous with its yellowing burdens."

PEACHES.

A more than average peach crop is reported this season. In a few locations orchards have been injured by water, but on the whole the crop has been a good one and in advance of the yield of last season. Prices, however, have not ruled so high as last year, when the almost total failure of the crop in the Eastern States created an extraordinary demand for California fruits at phenomenal prices. Fair returns for good fruit, however, have been the rule. Unpeeled dried peaches ranged from 5 to 6 cents for good to choice; peeled peaches commanded 9 to 11 cents.

In regard to the profitableness of the peach crop in sections favorable to its growth, it is reported that an eight-acre orchard, the property of Giblin Bros., near Yuba City, the trees of which are now three years old, paid its owners at the rate of \$362 50 per acre. Of this amount \$2,814 was received for fruit sold to the cannery, and the remainder was sold to other parties. From one hundred and fifty acres of fruit in the Abbott & Phillips orchard in the same vicinity, the owner realized \$200 per acre, or \$30,000 for the orchard.

C. E. Williams, in his paper on "Fruit Growing in the Sacramento Valley," gives the early history of the peach:

"The first peach trees planted in the Sacramento Valley were set on the banks of the Yuba River, some two or three miles above the city of Marysville. There in 1852 was planted the first peach orchard of that section, and probably the first in the State to assume prominence from a commercial standpoint, although peaches of very inferior sorts had been grown by the Spaniards for nearly one hundred years previously.

"From the small beginning there made by George C. Briggs, the business has increased until there are now in the Sacramento Valley and adjacent foothills almost twelve million peach trees, of which one and one quarter million are in bearing. A conservative estimate of the value of these orchards is from \$5,000,000 to \$6,000,000. The annual product is not less than one hundred and fifty million pounds, which should be worth not less than \$3,000,000, or a gross return of \$150 per acre. Of this \$3,000,000 a large part is expended for labor in the orchards, and other large amounts are paid by the canners, shippers, and driers who handle the product. This great sum of money is paid to the working men, who immediately distribute it among the various classes of merchants, and thus it at once enters into the regular channels of trade, benefiting all more or less."

In regard to the best varieties for the market, W. J. Wilson & Son, of Placer County, who ship a great deal of green fruit East, state that for table use the freestone varieties are the favorite:

"A comparison of prices realized in such cities as Boston and New York during last season, would lead many to suspect that the clings had established themselves so far in the lead as to leave no doubt concerning

their superiority over the freestones. The explanation of the matter is that the clings were of standard varieties, such as the McDevitt and George's Late, and being allowed to properly mature before picking, they attracted attention when placed upon the Eastern markets, and as a result commanded very high prices. Growers need not concern themselves about the fear of overproduction of either clings or frees, provided standard varieties only are cultivated."

In this connection it may be well to say to those irrepressible pessimists who are eternally declaring that overproduction is an obstacle that may result in the producer's ruination at any time, that in New York City alone last year there were sold of oranges, lemons, grapes, bananas, and pineapples, a quantity equal to sixteen thousand carloads, while two hundred and seventy-five carloads represents the entire amount of California fruit sent to that city during the same period.

Such clings as the Orange Cling, Lemon Cling, Runyon's Orange Cling, McDevitt's Cling, Phillips' Cling, McDevitt's Cling, and George's Late Cling are desirable, owing to their richness of color, largeness of size, and superior shipping qualities. All are good bearers, a quality much sought after by growers, and ripen in the order named. In freestones the grower is recommended to such varieties as Early Imperial, Hale's Early, Crawford's Early and Crawford's Late, Foster, Susquehanna, Muir, and Salway. Many object to Hale's Early as being an undesirable peach, but the fact remains, nevertheless, that its earliness and good size render it a valuable addition not to be overlooked.

But little mistake can be made in planting peaches, provided soil and climate are adapted to their growth, proper varieties are selected, and proper attention paid to them. While California is not the only peach-growing State in the Union, it has advantages enjoyed by no other. Its fruit is earlier, larger in size, superior in flavor, and the trees begin to yield profitable returns much earlier than in the East. Another advantage possessed by her is in the fact that destructive diseases which are now ravaging the orchards of the East are unknown here. The "yellows," which has proved fatal to vast peach areas in the Eastern States, has not obtained a foothold in this State, and with the vigorous system of quarantining introduced by the State Board of Horticulture, but little danger from that source need be apprehended. With these advantages, and without serious diseases affecting our trees, the demand for California peaches will increase each year, and there will be little danger of overstocking the market with the fruit at fair prices.

THE PEAR.

One of the most hardy and most profitable fruits of California is the pear. It is a hardy grower, will stand a great amount of ill treatment, and thrive under conditions where other trees would fail. It does well on the coast, in the interior valleys, and on the foothills. In soil it has little choice, thriving in the hard adobe, the richer alluviums, and the sandy loam, while even in land impregnated with alkali it will grow and bear fruit. It does best, however, on the heavy alluvial lands of river bottoms, where it attains its largest growth and gives the greatest returns. While the pear will bear a great deal of neglect and exist under it, returning fair crops, it appreciates good treatment and amply repays the care bestowed upon it, and if properly cultivated and cared

for it will yield large returns to the grower. Its fruit possesses excellent keeping qualities, and can be shipped in its green state, canned, or dried. Shipped green it reaches the market in its prime condition, and the pear has done as much for the upbuilding of California's reputation in the East as any other one fruit.

In regard to the most profitable varieties of pears, General Chipman says:

"The pear is one of our most profitable fruits. The pear has almost disappeared in the East as an article of fruit commerce, and the yield is always precarious. The canning of pears on an extensive scale was left to California. Summer pears should be gathered ten days before they are ripe, and autumn pears two weeks. Winter varieties may hang, if they will, until the leaves begin to fall. Don't let your trees overbear; thin out when the fruit is small. Of the summer pear, there is no use planting any but the Bartlett. It is good for market or canning; large, buttery, with rich musky flavor; erect grower, bears young and abundantly. Other good summer pears, such as the Le Conte, Clapp's Favorite, Souvenir du Congress, are on the lists, but their resemblance to the Bartlett is their chief recommendation, and why buy an imitation when you can get the standard genuine? Of autumn pears, plant Beurré Clairgeau. It is highly flavored, valuable for market, bears transportation, ripens in October and November. Beurré Hardy, Duchesse d'Angouleme, Kennedy, and Seckel are all good.

"Of winter pears, plant Easter Beurré, keeps December to March; Winter Nelis, December. The Winter Nelis is a good shipper and valuable for market. Unless you are planting several varieties to meet shipping and market wants for green fruit, I would stick to Bartletts, because if you can't ship the canners will take them.

"If you want a winter pear to follow up your Bartlett, plant the Winter Nelis. Mr. Gray, General Bidwell's former Superintendent, stated before the State Horticultural Society that there is no fruit that will bring in as much money to the northern part of the State as the Winter Nelis. He says they sell all they have at 2 to 4 cents a pound and could sell more. He further says: 'We have never had a failure, and it seems to be a very profitable tree, yielding from \$400 to \$700 or \$800 an acre.' At the same discussion, Mr. Stone, of Compton, said his Bartletts yield \$5 or \$6 to the tree.

"Strong, rich, sandy loams are good, and these pears also do well on heavier soils; indeed, in some places, the heavier soils are the best."

THE CHERRY.

California cherries, like all other fruit products of the State, are remarkable for their size, flavor, and beauty of appearance. Their size dwarfs that of their Eastern competitors, and even when grown from imported stock the favorable condition of soil and climate renders the fruit so much superior to that grown in the East as to cause experts to doubt whether it is the same variety. It is told of an Eastern pomologist, who had sent trees to Alameda, that he was once present in the fruiting season of the orchard, and could hardly be convinced that the fruit he saw there grew upon his trees.

The cherry crop of California, while it aggregates a large amount, does not take rank among the first fruits in quantity of output. It is

far exceeded by the orange, prune, raisin, peach, and pear; yet it has always been found a remunerative crop under favorable conditions.

Alameda and Santa Clara Counties are the chief cherry-producing sections of the State, and from there nearly one half the output is made. Next in order come Solano, Napa, Placer, Sonoma, Santa Cruz, and Sacramento.

Experiments with the cherry in the hot, dry interior valleys have not proved successful, and it is generally accepted as a fact that it does not do well there, although some varieties, where tried, have given good results.

The cherry does best on a sandy loam, of good depth and well drained. It does not do well in heavy clay soil or on adobe. Probably the largest cherry trees in the United States are owned by Robert Hector, on the North Fork of the American River, near Newcastle, in Placer County. One of these is nearly ten feet in circumference and over eighty feet in height, and its yield the present season was three thousand pounds. Three hundred ten-pound boxes were packed from this one tree. It is of the Black Tartarian variety, and was planted in 1853. The location is particularly favorable for cherry growth, being an amphitheater, protected on all but the south side by hills. The soil is a very deep, warm, dry loam.

The stock mostly used in this State is the seedling or wild cherry, many varieties of which are hardy and strong growers. The Mazzard, a wild cherry of Europe, is preferred by many. Where dwarfed trees are desired, the Mahaleb stock is used.

In planting care should be taken to select good, well-drained, sandy loam, which should be plowed at least twelve inches deep and well harrowed. The trees should be set thirty feet apart, or more. After planting, the young trees should be cut off two feet from the ground, leaving the last bud uninjured about half an inch from the top. Cover the top with hot wax and cut off all side limbs. At the second pruning three to five limbs, twelve inches long, should be left, cutting off all the rest. On upright growing trees the branches should be cut to an outside bud, and on those of a spreading habit to an inside bud. At the third pruning cut back one half or two thirds, and thin out to make a well-balanced and good proportioned tree. The fourth and fifth prunings will be about the same, after which but little pruning is necessary. In cutting old cherry limbs it is necessary to cut to a crotch, as the stub will die and likely involve the life of the tree. It is also an absolute necessity to use hot wax on the severed limbs.

Respecting varieties of cherries, a noted author writes:

"There are quite distinct groups or families in cultivation—two of the sweet class and two of the sour or acid class. The first, or sweet group, with mild, sub-acid fruit, are trees of rapid and large growth, and are divided into two sub-groups. The Bigarreaus, with firm-fleshed and meaty fruit; these are white, yellow, red, and black. The Napoleon Bigarreau and Yellow Spanish are types. The Hearts, more usually with heart-shaped fruits, with softer, sweeter pulp than the first group, but of the same colors. The Black Tartarian and Early Purple Guigne (pronounced 'jean') are types of the heart-shaped group. These divisions are arbitrary, but they are useful for classification.

"The acid cherries are divided into two sub-groups, and are a little more clearly defined. They are the Dukes and Morellos. The Dukes,

in general appearance, are about half way between the Morellos and sweets. The trees are small, and generally of an upright growth. The fruit is generally acid or sub-acid, though the sweetest cherry when ripe, the Belle de Choisy, is placed in this sub-group. The May Duke and Carnation are types of this group. They all do finely on this coast. There are some very fine dessert cherries among them, if allowed to become fully ripe. The May Duke, nearly black—Reine Hortense—perhaps the most desirable on this coast, is a beautiful tree, and an enormous bearer of large, delicious fruit. The Belle de Choisy is a very pretty light coral red, round, sweet, and delicious. The tree is very erect, and is a great bearer. The trouble with the Dukes is that they are rather watery and tender for cooking, too soft for shipment, and rather acid for dessert use. The May Duke, however, comes near being an exception. It is highly prized everywhere, and especially where the climate is a little too cold for the sweets.

"The Morello group comes last. These are usually small, round-headed trees, with slender, drooping branches and small, thick leaves. This group is divided into two sub-groups, one of which is the Kentish or Early Richmond, Early May, etc. It is a small, round, red, soft, acid fruit. It ripens early and quickly. The fruit, though watery, is highly esteemed for pies and canning everywhere except in California. There are several better, though later, cherries in this group than the Kentish. The Montmorencies belong in this group. Their foliage is smaller than either of the other groups and healthier in an unfavorable climate. These are the renowned cherry pie fruits. They are very dark red—nearly black—mostly round, quite firm in skin and flesh, and very acid. Some of them are very rich when fully ripe. They ripen very slowly and are used for pies weeks before they are ripe. Few people know how good the common Morello is when thoroughly ripe, simply because they never saw a ripe one. The common black Morello, the type of the group, is the hardiest and healthiest of our old varieties of cherries. Some of the varieties of this class are red and light red, but none are as good as the common black Morello. The black English Morello is the largest of the class. The tree is small, conical, enormously productive, late, and very acid, much like some of the plums and ripe American gooseberries, so acid that sugar will not sweeten them. This was once the most profitable cherry in the East, but the plum curculio eventually destroyed all the fruit.

"The Chicago market is usually abundantly supplied with cherries from the eastern shore of Lake Michigan. The sour cherries bring about double the price of the sweets, and are taken in unlimited quantities. The same is true in other large cities.

"Here is a hint to the fruit growers of this coast: There is money in the Morello group of sour cherries. They are prolific bearers, are much healthier and harder than the sweets, are better shippers, and, when cherries are plenty, bring more money. The Montmorencies are perhaps really the best, but the English Morello sells best, though it may be the poorest cherry in the world. It makes fine sweet pickles.

"Professors Budd and Gibbs have selected and imported many fine, hardy varieties of sour cherries from the north of Europe and Russia. Some are showing good promise. This coast is sending fine eating cherries East, and leaving the demand for culinary cherries unfilled.

There is no shipping market for soft, red, sour cherries, but there is for the right varieties."

A dwarf variety of the cherry known as the sand cherry (*Prunus pumila*, L.), is a native of the Dakotas. It is found throughout the valleys of the James and Missouri Rivers. It grows readily from the seed, and can be propagated from root cuttings. It is a rapid grower, and begins to fruit the third year from the seed. It is the most dwarf of all the cherries, growing in the form of a bush, like the currant, and seldom attains a height of more than four feet. It branches freely, and when in full flower, in the month of May, it is an ornamental object. The flowers are produced in clusters of two or three from every bud on the one-year old branches. They appear with the leaves, the blossoms completely hiding the young leaves from sight. In size they are like the bloom of the wild plum, in all other respects resembling closely the flowers of the cultivated cherry. They differ from the other forms of wild cherry (*P. scrotina* and *P. virginiana*) in the flower cluster, the latter having their flowers in drooping racemes.

Classifying roughly, according to the fruit, we find yellow and black fruited sorts. The yellow-fruited sorts, as a class, are earlier than the blacks, and of rather better flavor. They are greenish yellow when fully ripe, and vary in size, the largest being about the size of a medium Early Richmond cherry. In quality they differ greatly; on a few bushes the fruit is almost free from the crude "puckery" flavor common to all wild cherries, but the majority are no better than choke cherries. The stone is as large or larger than in the Early Richmond, and the pulp is very watery, having little substance. The skin is rather tough, and varies greatly in thickness and stringency in different plants. Cherries selected for size and flavor were cooked, the fruit of several plants being cooked separately, the pits being removed in all cases before cooking. The best gave an insipid sauce, having little of the character of the cultivated form of the cherry, and yet good enough to be relished where no other fruit can be had. A jelly of inferior quality, of a light yellowish green color, was made from the juice pressed from the fruit before cooking. Jam made from the fruit was less palatable than the stewed cherries. As the fruit is very juicy the jam consisted almost entirely of the skins.

The dark-colored sorts range from dark red to deep black, and in size, quality, and season vary as much as do the light-colored kinds. Seeds have been saved from the best of all the bushes, and their action under cultivation will be observed.

While of little value when the quality of the fruit is considered, it would seem that these dwarf cherries should give rise to a race especially adapted to the West. They have withstood all the dry weather of the past three years without injury, and they have been covered with bloom for two seasons, though unprotected during the winter. Their flower clusters and fruits show a close relationship to our cultivated forms, and hence crossing with the latter should be feasible. In this way varieties having qualities superior to the natives may be secured. This variety is wholly unknown in California, but it is not improbable that by means of careful selection a variety adapted to our climate, and possessed of advantages for some sections, might be secured.

THE FIG.

Considerable interest has been taken in fig growing of late years. This interest has been heightened by the report of this Board for 1889, wherein the subject was very thoroughly dealt with. The introduction of the Blastophaga, said to be the fecundating insect of Smyrna, by Mr. James Shinn, of Niles, and the discussion of its merits in the matter of caprification, have further added to this interest. As yet the fig cuts no large figure in our exports of fruits, although some species do well in most portions of the State, and the most tender varieties make an excellent growth in some portions. Much discussion has been indulged in as to whether California had the true Smyrna fig. To set this at rest the State Board of Horticulture procured direct from Smyrna a shipment of fifty well-rooted four-year old trees. These arrived in excellent condition and were distributed over the State. Over two thousand applications for trees were made to the Board, and out of these careful selections were made, considering locality and facilities for cultivation and care. Reports received from some of those who received these trees show that they have done well, in some cases a growth of over two feet having been made. The wide distribution of these trees gives an assurance of a thorough trial of the Smyrna fig in the various sections of the State, and a guarantee of the spread of the genuine fig of commerce wherever it shows its best qualities.

Some very excellent figs have been produced by Hjalmar Newman, at Porterville, Tulare County, who gives the following as his experience in the treatment of the fruit:

"The best figs for drying are raised in the district of Aidin, in the valley of the Mender, and the peculiarity with this kind of fig is that they are not palatable when fresh, but delicious beyond comparison when dried. At the packing-houses in Smyrna these figs are assorted, and the best packed in shallow wooden boxes, branded Elemé, and the second class packed in drums. As cuttings from the trees in Aidin, when transplanted in other localities, only produce very inferior fruit, it seems to me that soil and locality are of more importance than is generally believed. The true Elemé fig is seldom brought to the United States of America, but figs from the valley of Lucania, Calabria, and Terra d'Otranto are used as a substitute. On what large scale the fig industry is carried on in this part of Italy, we may get an idea, when we hear that two small communes—Galatina and Cutrofiano—yearly prepare and export about two million pounds of dried figs. In the vicinity of Naples enormous quantities of figs (mostly Fico de Oro) are produced, but nearly all are consumed fresh. Here I will mention that the Californians have not yet learned how to eat figs in a proper way. An Italian seldom eats figs without bread.

"Other localities in Italy and countries around the Mediterranean Sea have nearly all their different ways of curing and packing the figs. Some peel the figs before drying; some split them; some bake them in ovens; some stuff them with walnuts or almonds, or season them with thin shavings of citron peel or cinnamon, cloves, anise, and fennel; some roll them in flour; and some dip them in honey, cook them in copper-lined kettles, and put them up in varnished earthen pots. Figs thus prepared seldom find their way outside of Italy, as they are chiefly used as gifts to friends, and the supply is very limited. The refuse of the

Smyrna fig market and all the inferior fruit from places where first class figs cannot be successfully produced, finds its way to the Austrian 'chicory coffee makers,' or to the French distilleries, in which latter places the figs are converted into fine champagne, wine, cognac, and vinegar. The liquor known as anisette is made in Spain from figs, also the ardent spirit aguardiente. In France early figs are obtained by pricking the eye of the fig with a needle dipped in sweet oil. Thus we find that the fig producers around the Mediterranean Sea, by making their fruit palatable and useful in many different ways, always find a good market and make their orchards pay, although very few have the privilege of location in the valley of the Mender.

"Coming generations, who will have their main living from the California fig culture, will bless our efforts even when our names are forgotten, and the weary laborer or invalid who seeks refuge from the summer heat under the dense foliage of California's grandest fruit and shade trees will surely send a sigh of thanks to the man who took the trouble to plant them. To reach the goal we must labor together, and frequently relate our experience in fig culture in order to correct and be corrected.

"What I consider the most important for the success of a fig orchard is the choice of locality. My fig trees, Fico di Fragola, or Strawberry fig (here called 'White Adriatic'), are planted on dry bog land near Porterville, and I have chosen this locality for the following reasons: The dryness of the climate, the warm nights, absence of fog, its rich and warm soil, and facilities for irrigation. The trees receive water in abundance up to the first of July, but from that date not a drop. I use dwarf pruning, and take good care to prune my trees inside in order to let in air and sunshine; all suckers and weeds are strictly prohibited. I pick the fruit when perfectly ripe, and dry it without using any sulphur or lye. The largest figs, and also such as may burst open, are split lengthwise and cured in the same way as Dottati figs in Tuscany, *i. e.*, seasoned with anise, or fennel seeds. All figs are dipped in boiling water before packing.

"The Dottati figs I mentioned above are supposed to be identical with the figs that Plinius says were brought by Lucius Vitellius from Soria to his villa at Alba."

THE OLIVE.

In the year 1889 the subject of olive growing was very exhaustively treated in a bulletin issued by this Board. The industry at that time had become an important one, and increased attention has since been directed to the growth of the olive for its oil and for the table. A difficulty which met our growers was the competition of cheap, adulterated oils, domestic and imported. So formidable was this difficulty that it was determined to organize the oil men of the State into a protective association, and for this purpose a meeting was held at the rooms of the State Board of Horticulture on July 8, 1891, and the organization adopted a label for their oils, which were guaranteed pure, and Justinian Caire, of San Francisco, was appointed agent of the association to handle its products.

The following Board of officers was elected for the year:

Ellwood Cooper, Santa Barbara.....	President.
John Bidwell, Chico.....	Vice-President.
Justinian Caire, San Francisco.....	Treasurer.
B. M. Lelong, San Francisco.....	Secretary.

The membership was divided into two classes, active members being those actually engaged in the commercial production of oil, and honorary members being those engaged in olive growing, but who have not packed oil for the market. So soon as an honorary member becomes a producer of oil for the market he is entitled to full or active membership.

While the olive oil industry has been a slow one, it has none the less made satisfactory headway. Ten years ago the only brand of oil put up in the State for the market was that manufactured by Ellwood Cooper, at Santa Barbara; to-day there are fifteen active members of the association who have registered labels, and twenty-three honorary members who will soon enter the field as producers, besides numbers of others who have turned their attention to the industry within the past season.

Total Product by Years.

1888.....	590 gallons.
1889.....	1,142 gallons.
1890.....	5,202 gallons.
1891.....	11,011 gallons.

It should be further explained that the returns for 1891 are but partial, a large proportion of the oil being in process of manufacture when these returns were made. Enough is given, however, to prove that the olive oil industry is becoming one of great importance in the State, although as yet in its infancy.

When it is considered that the importation of foreign oil in 1890 amounted to 893,984 gallons, valued at \$819,110, while our domestic output will not amount to much over a seventy-thousandth part of that, it would seem that a good field is opened to the producer of olive oil in California.

The olive, so necessary to the every-day life of the Latin races of Europe, is largely a stranger in America, and our people have not yet awakened to its importance and usefulness as an article of diet. The olive is regarded by most people as an article of luxury and its oil as a medicine. This prejudice forms another obstacle in the path of California olive growers, that only the education of the people can remove. When it becomes known how much better an article of diet pure olive oil is than hog's lard, or even butter, there will grow up a demand for it that will make its production on a large scale profitable. This object the association is working for, and while the work is somewhat slow at the beginning, its success has so far been encouraging, and pure California olive oil is making a name for itself in the market.

The olive will thrive under distressing conditions, although it repays proper attention. It will do well on lands where other fruits would fail, and will be found to be profitable in much of the "waste" lands of the State. It will stand a winter temperature as low as 20 degrees without injury, and will live and bear fruit for a fabulous time. Some trees in Europe and Asia are still fruiting which are said to be over a thousand years old. In Europe no fruit is expected from the young trees until they have attained the age of seven years. In California they will

begin to bear in three to four years, and some precocious trees are reported in Santa Barbara to have borne as young as two years old.

During the year 1891 a great many olive orchards have been planted in various parts of Southern California, and in the coast counties. In Santa Barbara County a company, known as the Moramar Olive Company, has been formed, the purpose being to plant an extensive olive orchard on the Hall ranch in Carpenteria. The capital stock is \$150,000, divided into thirty shares of \$5,000 each. It is proposed for the owners of the ranch, which consists of five hundred and seven acres in Carpenteria and a valuable water right, to put in their property at a valuation of \$45,000, a part of which is to be taken in the stock of the company. C. F. Eaton, of Montecito, proposes to furnish the necessary olive trees to plant three hundred acres of the property, in part payment of which he will also accept stock. One hundred and fifty acres are to be set out the first year, and the balance the second year, and it is calculated that when the trees are four or five years old they will yield a yearly revenue of \$25,000, which will increase as the trees grow older. The water on the property will be developed and piped for irrigating purposes.

THE RAISIN.

The raisin of late years has received more attention than any other fruit in California. The ease with which raisin vines were propagated, their early returns of profit, large yield, and the good prices, gave an impetus to the industry which has been remarkable. In the winter of 1890 there were reported sixty-eight thousand eight hundred and thirty-seven acres of raisin vines in the State; to this may be added twenty-five thousand acres planted in the spring of 1891. Of these there are about one third in full bearing. The output for the past season was 2,641,590 boxes. Of this amount Fresno County has produced considerably more than half. The exact figures are: For Fresno County, 1,376,795 boxes, and for all the rest of the State, 1,264,795. Thus it is seen that Fresno produced 126,795 boxes more than all the rest of the State combined.

The total output of the State is 52,831,800 pounds for the season.

When it is considered that not more than one third of the raisin vineyards now planted are in bearing, and that it is estimated that ten thousand acres of new land will be set to raisins this season, the magnitude and importance of this industry to California can be appreciated.

A large portion of the crop this season was shipped in sacks to the East, where it was repacked in boxes. The rapid increase in the output of raisins in this State has had the effect of very materially replacing the imported article, and we may confidently expect that in a short time the United States, instead of being an importer of raisins, will become an exporter. Efforts are already being made to establish a trade in London for our fruits, and also to introduce them to other European markets. This has been forced by the present large yield and the prospective increase in the output, which will necessitate a larger market for the raisin product than the United States will afford.

Prices opened fairly well in the beginning of the past season, some of the earlier pack being contracted for at 5 cents in the sweat boxes. These prices, however, declined until 3 cents was reached, with the supply fully up to the demand. The New York "Commercial Bulletin," of

December 20, 1891, commenting upon the advance being made by the California raisin against imported fruit, says:

"The trade of the season now closing has been in strong contrast to the corresponding period of previous years. Instead of the heavy importations of raisins and prunes that had been made annually from Spain, France, Bosnia, and Servia, the business in these foreign products has been growing steadily less the past few years until it looks now as if California will, in time, succeed in monopolizing the entire trade of the country. From experiments at the beginning, only some six or eight years ago, the fruit-growing industry on the Pacific Coast has made wonderful progress, and if the same enterprise is shown in the next several years foreign raisins and prunes will undoubtedly be forced to seek a sale in markets other than in the United States."

The "Bulletin" discusses in detail the gradual introduction and growing popularity in the market of California Malagas, Valencias, and prunes. On Valencias, the paper says:

"Facts have proved that with the constantly increasing crop on the Pacific Coast, coupled with the introduction of a new style of packing in bags, the forcing of goods against the sale of imported has been rather an easy matter, and the trade prices of California this season have been abnormally low. This fact certainly has assisted the sale of home products. But on the other hand, when the difference was less great between imported and domestic, the latter stock in bags appeared to have a decided preference."

The raisin industry has been the outgrowth of the past twenty years. Prior to that time, while some thought raisins could be successfully produced in California, no efforts to grow them on a commercial scale were made. In 1873 a shipment of six thousand boxes was made from Yolo County, and from that time raisin growing advanced until it has become one of the most important industries of our State. As indicating the rapidity of its growth and its present importance, the following figures, showing the shipments for each year from 1873 to 1891, are given:

YEAR.	Boxes.	Pounds.
1873	6,000	120,000
1874	9,000	180,000
1875	11,000	222,000
1876	19,000	380,000
1877	32,000	640,000
1878	48,000	960,000
1879	65,000	1,300,000
1880	75,000	1,500,000
1881	90,000	1,800,000
1882	115,000	2,300,000
1883	125,000	2,500,000
1884	175,000	3,500,000
1885	475,000	9,500,000
1886	703,000	14,060,000
1887	800,000	16,000,000
1888	1,250,000	20,500,000
1889	1,638,900	32,678,000
1890	2,341,463	46,829,260
1891	2,641,590	52,831,800

The relative importance of the various raisin-growing localities may be seen at a glance from the following figures, showing the sources of the crop of 1890, these being the records of actual shipments made:

	Twenty-pound Boxes.
Fresno	1,050,000
San Bernardino	629,913
Yolo	300,000
San Diego	175,000
Los Angeles	40,000
Sutter	17,000
Shasta	6,000
Solano	14,000
Yuba	17,550
Santa Clara	40,000
Sonoma	15,000
Merced	17,000
Ventura	10,000
Colusa, Tehama, etc.	10,000
Total	2,341,463

The following table shows the quantities of raisins imported into the United States for the past eight years, together with the value thereof. While there has been an increased importation in the past two years over that of 1889, the general tendency is to a decrease. While there has been a material increase in the population of the country in the past eight years, there has been a considerable falling off in the importation of raisins, which indicates that the domestic is rapidly replacing the imported article:

Quantities and Values of Raisins Imported into the United States from 1884 to 1891.

YEAR.	Quantity—Pounds.	Value.
1884	53,702,220	\$3,290,150
1885	38,319,787	2,661,699
1886	40,387,946	2,885,123
1887	40,673,288	2,881,981
1888	40,476,763	2,070,120
1889	35,091,139	1,736,786
1890	36,914,330	1,997,103
1891	39,572,655	2,018,879

CHAPTER III.

NUTS, BERRIES, AND MISCELLANEOUS FRUITS.

WALNUT.

The English walnut (*Juglans regia*) flourishes exceedingly well in many parts of the State, and where soil and climate are adapted to its growth is very remunerative to its grower. The tree makes a remarkably thrifty growth in the fertile valleys of California both north and south, but its favorite habitat is in the coast valleys of Southern California, where it reaches its perfection both in size and fertility. Large quantities of nuts are produced in Ventura County, where the industry has become a prominent one. N. B. Smith, of Ventura, estimates the value of a fifteen-year old walnut tree at \$400, basing his estimate upon the value of nuts produced annually. On some trees in that county as much as \$60 worth of fruit has been gathered from a single tree. Near Rivera, in Los Angeles County, there is about a square mile in walnut trees, a large portion of which are not yet in bearing. From these last year the Walnut Growers' Association sold six thousand five hundred and thirty-six sacks, netting \$60,000. This season (1891) the yield will be fifty carloads. Last season the nuts sold for 8 and 10 cents per pound. As much as \$450 worth of fruit has been harvested from a single acre of walnuts at Rivera, and it is estimated that a ten-year old tree there will return an average of two hundred pounds, and increase in its output continually from that age.

George B. West, of Stockton, who has made a success in walnut growing, gives his experience this season with the walnut at Stockton, as follows:

"I propose to give my experience with the French walnuts, which I have had ample time to test, having imported them in 1861, and I must say in the beginning that it has been very satisfactory. Their growth is slower and the wood is much harder. There has been no freezing of the young shoots, but a regular, sturdy growth.

"They are fertile, bearing regular crops. Some of the varieties are so full of fruit that I have been obliged to thin them so that the crop would not injure the tree. The quality of the nut is excellent—far superior to the Los Angeles nut. The shell on most varieties is very thin, and the size of the nut on mature trees is fully up to the average. One variety, the A Bijou, is by far the largest nut grown in the world.

"A description of the varieties which I have tried is necessary in order to give the reader a correct idea of their value.

"First—The A Bijou, the largest walnut known. This variety began to bear when it had been planted four years, and has constantly increased its yield. Last year it bore a large crop, and this year it set its fruit so quickly that I thought best to remove at least one third of it. The reputation of this tree in its home, France, is that of a shy bearer. The quality is excellent; superior to anything I have ever seen.

"Second—The Præparturiens. This variety has proved exceedingly satisfactory. It will bear in nursery rows when not more than four feet high, and continue to have a crop every year, and has never been injured by spring frosts. On my place are seedlings of the second and third generations which still convey their fertile and early bearing qualities. The nuts on mature trees are of good size and of the best quality.

"Third—The Serrotina, or Late St. John. This variety came into bearing on the fifth year from planting. It is of less value than the preceding. Its flavor is not quite so delicate, and the shell is a trifle harder; but as it is a week later in showing leaf in the spring, it will suit frosty localities.

"Fourth—The Mayette. This is one of the varieties that is depended upon in France for a crop. My trees did not produce until the sixth year. They are a large, excellent nut, and reproduce themselves very true from seed.

"Fifth—The Chaberte is also a good, thrifty, hardy variety, and one grown in France for a good crop.

"All of the above kinds are of value in Northern California. They have proved successful in San Joaquin in the foothills, and there is no reason why all similar localities should not be equally successful. In the coast counties they would no doubt be much more at home, and although they can be grown in warm, dry localities, I believe their proper place is where they can feel the influence of the sea air; but as there are many people inland who would like to have walnuts grown at home, my experience in so warm a locality as Stockton may be interesting to them.

"The walnut requires a deep, rich soil; one in which the roots will strike deep, so that there can be no pinch in the hot summer weather.

"The worst enemy to this tree is the red spider, or *mite*, which, being a native of this State, is liable to attack the leaves in any locality where the air is dry. They can be combatted by spraying with the usual solutions recommended by the State Board of Horticulture.

"There is also a fungus which injured my trees two years in succession. It has nearly disappeared, and the trees are very healthy now.

"I would state, in conclusion, that I have no interest in the nursery business—no trees or nuts for sale. My object in writing this communication is simply to warn enthusiastic-beginners against unprofitable ventures. None can be more so than the cultivation of the variety of the walnut.

"I could soon convince any one who would visit my place of the comparative value of the French and English kinds; both are grown under the same conditions; the English, large, old trees almost destitute of nuts, and the French, five varieties, all loaded with a healthy crop. I could show trees which have been planted only three years, having all the nuts that they should be allowed to bear.

"Experience has taught us that the seedling English walnut is a failure in Northern California. It is not perfectly hardy in the inland counties, making a strong growth while young, which is cut back by an extra cold winter, and when it has attained a size suitable for bearing a crop it proves to be barren. I have trees on my place thirty feet high, twenty years old, that have never borne twenty nuts in a year; this is the experience of most planters.

"Gathering the walnut crop is a simple process, and merely consists of picking up the nuts from the ground where they fall when ripe. But in order to have a bright, clean nut, it is necessary to gather them from under the trees every day; and to preserve the kernel plump and in a highly flavored condition the nuts, after they are gathered, should be dried in the shade. A good method is to put them in a tray, and spread out to a depth of from three to four inches.

"It is absolutely necessary that the soft-shell walnut be cared for as in the manner stated in order to prepare it for the market in a merchantable condition, owing to the thinness of the shell and its tendency to crack open and the kernel to shrivel up."

ALMOND.

The California almond had to force its way into the Eastern market in the face of a prejudice in favor of the imported fruit. This it has accomplished so well that, owing to its superior qualities, it sold in New York the present season, in October, 1891, at an advance upon the European article. Porter Brothers report having sold their 376 bags, 16,803 pounds, for \$2,844 61. The paper-shells brought 22½ cents, the soft-shells 16 cents, and the hard-shells 12 cents.

Almond culture has not received the attention that it should in this State. The tree does well on land that would not be considered first class for other fruits. It is a good bearer, if the right varieties are selected, requires but little care, and gives good returns. There is a good market for the product in the East, as is evidenced by the fact above alluded to, that California nuts bring more than those imported; and that there is a wide field for the California nut-grower is shown by the further fact that in 1891 there were imported into the United States 7,497,193 pounds of almonds from Europe, which were valued at the Custom-house at \$989,966.

Perhaps one reason why the almond is not more largely produced is that the Languedoc, a French variety, which has been generally planted, has not proved itself a profitable bearer. New varieties, seedlings, have been propagated in this State, however, that are reliable, and which yield certain crops, are very prolific, and the fruit of which is superior to the foreign varieties. This being demonstrated, there is no reason why California almonds should not soon replace the imported article, and the million dollars now annually sent to Europe to pay for these nuts be devoted to the upbuilding of this State.

Almonds are divided into three classes: the paper-shell, soft-shell, and hard-shell. Between these are others that blend the one into the other, and that cannot safely be classed with either variety. The paper-shell is the favorite in the market, and brings a much higher price than the soft-shell, while the demand for hard-shells is much more limited. The popularity of the California almond lies in the fact that its kernel is perfectly smooth and plump—qualities which are required by confectioners, who consume a very large proportion of the almonds produced and imported into the United States.

Almond growing presents many advantages, especially to the beginners in fruit growing. There is little to be learned about the business. The tree will bear much neglect, but repays careful treatment. No art is required either in gathering or curing the crop; the trees bear young

and bring early returns for the investment, and with the proper varieties and favorable conditions the crop is a profitable one. In the annual report of this Board for 1890, Webster Treat presents a very able and exhaustive essay on the almond and its culture, in which he states that when the tree is four years old it will bear an average of thirteen pounds to the tree, and last year there were taken from one hundred and ninety five-year old trees three thousand five hundred and two pounds, which sold in Chicago, at wholesale rates, for 22 cents per pound. This is at the rate of \$283 50 per acre on five-year old trees, planted twenty-five feet apart. Even from Languedoc trees there were gathered one year, when they happened to bear a good crop, fully one hundred pounds from one tree, which was twelve years old. With these fine new varieties that have been propagated in California, which bear much heavier than the Languedoc, and finer nuts, the prospect is for a very large yield when they are eight years old.

OTHER NUTS.

Among other nuts which give promise for the future the chestnut takes rank. But little attention has so far been given to it, but where grown it does well. It is adapted to heavy, clayey soils, and in California is a rapid grower. The varieties principally grown here are the Italian and the Japanese, the former being the favorite. The tree thrives in all parts of the State.

The hazelnut is native to the northern portion of the State, and can be found from the valley lands to the mountain tops. It is very productive and hardy, rarely, if ever, failing to produce a good crop annually. The bush is from three to eight feet high, and the nuts generally grow in pairs, sometimes three or four in a cluster, half an inch or more in diameter, incased in a thick, prickly hull, from which they are easily separated when ripe. It is found along the coast from Mendocino to Oregon.

Peanuts do well, and a number of experiments made with them in the season of 1891 give promise that they will soon become an article of export. In Tulare County C. J. Berry grew a large amount between the rows of a young peach orchard. The soil was a sandy loam, naturally damp, and the yield was very large, and the berries large and plump.

Pecans, filberts, and black walnuts are also grown to some extent, but not in sufficient quantities to warrant them to a position among the profitable products of the State.

CURRENTS AND BERRIES.

The currant crop of 1891 was not up to the average, nor was the fruit up to its usual standard. A hot spell which prevailed just prior to the ripening season had a blighting effect upon the fruit. The domestic demand was light, and the greater portion of the crop was disposed of to the canneries.

Berries generally yielded well, the strawberry crop especially being very large, and the fruit of more than usual excellence. Blackberries, raspberries, and gooseberries all gave good reports, and the producers found a ready market both for domestic consumption and for canning at fair prices.

On the subject of berry cultivation, D. Edson Smith, who is good authority, presents the following:

"In response to an invitation to present a paper on berry culture, I beg to offer the following, derived, not from theory, but from ten years' actual experience and observation in the Santa Ana Valley. My remarks will be confined to the culture of the strawberry, the blackberry, and the raspberry. Any land that will raise good corn is adapted to these berries, and one is not liable to make the ground too rich. Deep stirring and thorough pulverization of the soil before planting are essential to success. I deeply plow, and harrow my ground several times before planting, to facilitate irrigation, for all these berries need a large amount of irrigation.

"I prefer slightly ridging the rows for strawberry plants, and putting them far enough apart to admit of using a narrow horse cultivator between them, and place the plants from eight to twelve inches apart in the row. The ground allotted to strawberries should be divided into three parts, and one of these parts should be plowed up and reset every year. After the setting of the plants the success depends on thorough culture, freedom from weeds and runners, and proper irrigation. The strawberry feeds near the surface, hence the surface soil must be kept moist enough in some way to allow the feeding rootlets to take up the plant food from the soil. A mulching of straw will aid greatly in preventing evaporation. We have several good varieties of strawberries to select from. For an all-around berry I prefer the Monarch of the West, but let each one test the different varieties in his own neighborhood and then choose that which pleases him best.

"Prepare the ground for blackberries and raspberries the same as for strawberries, leaving it level. Make the rows from eight to ten feet apart, according to the richness of the soil, and put the plants four feet apart in the row. A new field should be planted every third year. While these berries do not feed so close to the surface as the strawberry, still they require a great deal of water, and proper provision should be made for it. February and March are good months in which to set out these berries. When the plant has grown to a height of three feet, I cut off the tip with a pruning-hook. This will cause the plant to throw out laterals; and when these attain a growth of eighteen inches, I clip their ends in the same way. I continue this clipping process throughout the growing season as often as the vigor of the plant demands, and through each year until the plant is dug out. After the plants come into bearing, the bearing canes must be cut out after each season's fruiting. Keep the space between the rows thoroughly cultivated and moist, and free from weeds and sprouts all the time. I use a knife cultivator and spading harrow. The soil in the rows, between and immediately around the plants, will have to be worked with a hoe. A few shovelfuls of manure thrown around the roots of each plant in the fall will be of great benefit. This is all there is to it—irrigation, cultivation, pruning, and feeding. As to varieties, I have settled down to the New Rochelle for a raspberry, and Crandall Everbearing for a blackberry.

"The Blackcap raspberry does not seem to thrive in a paying manner in Southern California, excepting in a few localities. Let each one try them, in a small way, and if they prove successful then enlarge the plant; for there is quite a demand for that variety of berry. The Cuthbert is the best of the red varieties that I have seen raised, but many

of us are ceasing to propagate it because of its tendency to winter-kill from some, to me, unknown cause. Still, in some localities, it proves to be very profitable. There will always be a good demand for this berry, and those who have the proper conditions should cultivate it.

"But the preëminently best raspberry for the market is the New Rochelle, a cross between the Doolittle Blackcap and the Cuthbert Red. The berry, when fully ripe, is of a purple color. It is of quite firm texture, making it a good shipping berry. Its quality is much inferior to the Cuthbert, but as it comes into the market when all fruits are scarce, and is almost gone when the Cuthbert ripens, it is eagerly sought after. It is a prolific bearer, vigorous grower, and entirely hardy and free from disease as far as I know. I plant no other kind for a market berry.

"Of the many varieties of blackberries the Kittatinny and Lawton were favorites with me for many years, but I do not intend planting any more of them, because the Crandall's Early, or Everbearing, is so much superior in every respect. It is entirely healthy, vigorous, and prolific. The fruit begins ripening early in June, and we are still (November 10th) enjoying an occasional dish of them for supper. They are free from core and of fine flavor; in fact, with me, they are 'the' berry.

"The marketing of our berries is an important item. We are now able to obtain well-ventilated boxes of various sizes very cheaply. Great improvements have also been made in the carrying crates, the best of which, so far as I have seen, is the Hall crate, made at Monrovia. It has folding partitions, and, while thoroughly ventilated, the fruit is protected from all insects and largely from all dust.

"Berries should reach the consumer the same day they are picked, in order to be in the best condition. This requires the pickers to get to work as soon as it is light enough to distinguish the ripe berries from the green. A berry should be fully ripe when picked. Care should be taken by the pickers to exclude from their boxes not only all unripe fruit, but also all defective berries and all leaves and stems that will detract from the appearance of the package. The filled crates should be taken to the market or depot in a spring wagon, in time to reach the consumer at the earliest possible moment.

"As to the profits of berry culture, it depends entirely on the location and the harmonious coöperation of the producers. If your rail and water facilities are all right, and you are located near a large town, then the profits will be satisfactory if all the growers in that vicinity will combine to hold the price at a fixed amount. But if you cannot do this there will always be the liability of some with a large crop and great need of present money sacrificing their crop for less than the labor was worth that produced it, and thus forcing all to sell at the same sacrifice. While this would temporarily be of benefit to the consumer, it might be suicidal to the producer, and so I would advise every one to carefully weigh the chances and thoroughly examine all the contingencies before investing all his capital in berry culture."

CHAPTER IV.

THE DRIED FRUIT MARKET.

The returns from dried fruits for the year 1891 have not been so large as were those of the preceding year. That they should be was hardly to be expected. In 1890 a combination of circumstances rendered the demand for our California dried fruit phenomenal. There was an almost total failure of the Eastern fruit crop, coming at a time when the supply of preserved fruit was exhausted; at the same time the California crop was not extra large, and the result was keen competition among the jobbers, and an advance in prices that was remarkable. California was called upon to supply the requirements of the entire United States. Such a demand was unprecedented, and, while it was of great benefit to those fruit growers who were in a position to take advantage of it, the return of such conditions cannot be looked for frequently, nor can an extraordinary season be used as a basis upon which to build our hopes for the future. Speculation in fruit aided in sending up prices, and it was thought early in the season that but little dried fruit of 1890 curing would be obtainable. This was especially the case with peaches, plums pitted, and apricots, although values in the entire line reached a high plane. The season's output, however, was much greater than was anticipated, and speculators and dealers incurred heavy losses, especially on late holdings. The result of this was to shake the confidence of speculators in dried fruits, and in 1891 very cautious purchases were made, and at lower prices than in the preceding year.

Prunes were the favorite in the market this season. The yield was much larger than ever before, the acreage having been very greatly increased in the past few years, and a very large area of new trees having come into bearing. The great bulk of this crop came from Santa Clara Valley, although Sonoma, Solano, and other northern counties contributed a very large quota to the total output.

The graded stock is now all marketed, and it would be difficult at this date to get orders filled for carload lots of the four sizes. Most of the prunes now remaining unplaced are 90-100s and smaller, with no evidence of there being any large amount of this class of stock still awaiting a market. The range of prices, exclusive of extra large sizes and fancy qualities, or very small and inferior stock, has been in wholesale circles from $4\frac{1}{2}$ to $6\frac{1}{2}$ cents in sacks, as to size and other conditions, with most of the business within 5 to 6 cents. The four sizes have sold mostly at $5\frac{1}{2}$ to $5\frac{3}{4}$ cents, but have been quoted lately at $5\frac{3}{4}$ to 6 cents, with the market tolerably firm under slim offerings, and prospects more favorable for values to harden than to recede as the season advances. Boxed prunes commanded only about half a cent advance over stock in sacks, the preference being given to sacks by nearly all large buyers.

Peaches of other than selected quality have dragged most of the season at generally low and irregular prices, and the more ordinary descrip-

tions do not give promise of cleaning up speedily at the low figures now ruling. Comparatively few peeled peaches came on the market from last crop, neither was there any decidedly active inquiry for this style. Peeled and bleached found moderate custom within range of 9 to 13 cents, but for peeled unbleached there were few buyers, values for this description being nominal, most of the time at 6 to 8 cents. Peaches unpeeled ranged from $3\frac{1}{2}$ to $7\frac{1}{2}$ cents for bleached from first hands, and 2 to $3\frac{1}{2}$ cents for ordinary sun-dried, although sales as low as 2 cents were the exception, and mainly of undesirable quality, accompanied with decided selling pressure. Bleached peaches, of first quality, obtainable at 6 to 7 cents, were sought after early in the season, and most of this class of stock had passed into the hands of jobbers as early as November. The bleached unpeeled dragged at $3\frac{1}{2}$ to 6 cents, and common sun-dried were sought after at $2\frac{1}{2}$ cents.

Plums were not cured as extensively, perhaps, as in some former seasons, but there were enough to accommodate the demand, and at the same time keep prices at very much lower levels than in 1890. Pitted stock constituted the bulk of offerings, and was the kind most salable. The market for pitted plums opened this season at $5\frac{1}{2}$ to $6\frac{1}{2}$ cents, with a few early sales at a little higher range. Prices were soon on a decline, however, with $5\frac{1}{2}$ cents a full wholesale figure during the greater part of September and October, and later on $4\frac{1}{2}$ to 5 cents was about all that was justified as a wholesale quotation.

Apples were turned out in fair quantity, but the quality of a large portion of the product was not all that could be desired, and considerable was decidedly inferior, especially sliced and evaporated, of Chinese packing. Early sales of evaporated, in boxes, were at $7\frac{1}{2}$ to $8\frac{1}{2}$ cents, with sliced, in sacks, $4\frac{1}{2}$ to $5\frac{1}{2}$ cents, and quartered $3\frac{1}{2}$ to $4\frac{1}{2}$ cents. In September prices receded fully half a cent, and in October there was further shading, especially on inferior stock, some poor evaporated, in boxes, going at $4\frac{1}{2}$ cents. During the past two months wholesale trade has been dragging on a basis of 6 to 7 cents for evaporated and sliced, in boxes, and $2\frac{1}{2}$ to $3\frac{1}{2}$ cents for sun-dried, in sacks.

Pears have not been offered freely this season, and there was a fair demand for desirable curings, such commanding moderately good figures. Peeled and sliced evaporated, in boxes, sold mainly within 6 to 8 cents, as to quantity and quality, with sun-dried sliced, in sacks, at $3\frac{1}{2}$ to 5 cents, and quartered $2\frac{1}{2}$ to 4 cents, little of really choice quality being obtainable lately at any figure.

Dried grapes, in common with other fruits, did not fare so well from a producer's standpoint as in 1890. The output the past season was of fair proportions, certainly not less than five thousand tons. Most of the yield has passed into second hands, and, all things considered, at fairly good figures. Efforts were made early in the season to purchase in wholesale fashion at $2\frac{1}{2}$ to $2\frac{3}{4}$ cents, but the attempt was not attended with noteworthy success. September and October business, and the bulk of the wholesale trading was transacted in these two months, was at $2\frac{3}{4}$ to 3 cents. Later on, with less inquiry, and that not very urgent, the market receded fully a quarter of a cent, with the range of values little more than nominal at $2\frac{1}{4}$ to $2\frac{3}{4}$ cents at the close of the year.

PART II.

HISTORY AND IMPORTANCE OF THE PRUNE
INDUSTRY IN CALIFORNIA.

CHAPTER I. HISTORY OF THE PRUNE.

INTRODUCTION AND GROWTH OF THE INDUSTRY.

The name "prune" is derived from the Latin *prunum*, a plum, and in its generally accepted designation is applied to those special varieties of the plum family that possess exceptional curing qualities, of firm texture, easily dried whole in the sun, or artificially, without fermenting at the pit. These varieties form the prune of commerce, and it is of those that the present paper will treat, although in the matter of soil, climate, methods of cultivation, etc., there is little difference in the propagation of the various members of the plum family, and the treatment adapted to one is usually applicable to all.

According to Theophrastus, the prune was cultivated in Asia Minor in most remote ages. Pliny speaks of its cultivation by the Romans, and makes mention of eleven varieties proceeding from the domestic prune introduced into Italy by Caton, the ancient. It grew without cultivation in the environs of Damascus, and a very rustic and vigorous variety, known as the Black Damascus, is much used by the nurserymen of Europe as subject for grafting all other varieties. The introduction of the prune into France is attributed to the Crusaders. If tradition is correct, this valuable fruit was first cultivated in the southwest of France by the inmates of a convent near Clairac.

In traveling from Aiguillon to Fumel, through the productive valley of the Lot, fertile plains are seen bordering the picturesque riversides, covered with plum trees, which furnish the famous prunes d'Ente and Robe de Sergent, which are exported to the remotest corner of the commercial world.

This valuable tree, which loves a temperate climate, does not confine itself to this special section of France, but is profitably cultivated wherever climatic and soil conditions are favorable to its growth, as is demonstrated by its extensive cultivation in the valley of the Loire, the departments of Garonne, Tarne, Dordogne, and Aveyron. The well known brand called Tours prunes comes from the orchards of the Loire.

INTRODUCTION INTO CALIFORNIA.

It is to France that California is indebted for this healthful and profitable fruit. Louis Pellier, a French sailor, who had visited many parts of the world, arrived in San Francisco in 1849, and went to work in the mines in Trinity County. He did not succeed well there, and finally removed to San José early in the fifties. Here he established a nursery. He soon after induced his brother Pierre, whom he had left in France, to join him in California, and the two brothers worked the nursery together until the spring of 1856, when Pierre returned to France in order to marry a girl to whom he was engaged. Combining business with matrimony, he secured a large number of cuttings of prunes, grapes,

and other fruits, which he brought back with him on his return. His bride and his brother Jean accompanied him, and, together with the box of precious cuttings, they made the voyage successfully, crossing the isthmus, and arriving in San Francisco in December, 1856.

The prune cuttings were procured in the Ville Neuve d'Agen, from whence the common California prune derives its name of Petit Prune d'Agen. They were carefully packed in a box about sixteen inches square by four feet in length, which was lined with cloth, and every precaution was taken to insure the safe arrival of what has since proved the germ of one of the most important industries of California. Upon its arrival the shipment was at once transmitted to Louis Pellier at San José, and a number of plum roots were grafted to the newly arrived prunes. This started the first prune nursery on the Pacific Coast, which was located in the city of San José, on Devine Street, between Tarraine and Santa Teresa.

The importance of Pellier's experiment was not at first appreciated. A German nurseryman named B. Kamp procured some grafts from Pellier, and also worked for the introduction of the prune. He was one of the first to put out prune trees in orchard row. But comparatively little attention was paid to prune growing, as a specialty, for a quarter of a century after its introduction into the State. The superiority of California as a fruit-growing State, however, at last forced itself upon public attention, and, among other fruits, the prune was given a trial, and it soon proved its great capacity as a profitable crop, and to-day it ranks among the leading industries of the Golden State.

GROWTH OF THE INDUSTRY.

Probably the oldest orchard of any size in the State is the Bradley orchard, on Stevens' Creek road, about two miles out of San José. This was set out in 1870. The success of this led others to go into prune growing, and the Dr. Handy orchard of one hundred acres, at Saratoga, followed in 1883; in 1884 the Buxton orchard, at Campbell, was planted, and prune growing and curing on a large scale became a fixed fact. From that time the growth of the industry has been phenomenal. The prune industry has been practically the growth of the past decade, for within that period the planting of orchards, their cultivation, and the proper care of their product, have grown into a system. In the prune center of Santa Clara County, which ten years since produced not a pound of this fruit, it is now exported by the carload. Above Los Gatos Mr. Morrell was then one of the heaviest producers, and his output was five to six tons per annum; he now packs from five to six carloads each season from the same orchard.

Santa Clara County was from the beginning the center of the prune industry, and here was demonstrated the fact that prune growing would pay; that no extraordinary care was required in cultivation or mysterious skill in preparation. As soon as these facts were demonstrated other counties took up the pursuit, until now the prune is found in all except the highest mountain counties in the State. In 1870 there were but 19,059 prune trees in the State, while the Assessors' reports for 1886, which are probably 25 per cent too low, give the number in the various counties that year at 1,077,841.

The Assessors' reports for 1891 show a very large increase in the past five years in those counties which have made returns.

A large portion of these trees, perhaps one half, are not yet in full bearing. It is estimated that when the trees now growing in Santa Clara County alone shall have matured the annual product will be over forty million pounds of dried fruit.

HABITAT OF THE PRUNE.

The prune is a very hardy tree, and will thrive in a wide range of climate and soil and at various elevations. Wherever the Green Gage plum will grow the prune can be grown. It will stand severe winter weather, and will grow where the thermometer touches zero. Its favorite habitat, however, is a temperate climate and a warm, generous soil. It can be grown in the Eastern States, but the short seasons there, the numerous pests, and the unfavorable conditions for drying which exist, prevent the East from ever entering the field as a competitor to California in the prune industry. Even in California, while the tree will grow in nearly all the counties, there are but few favored localities in which it appears at its best. In some sections of this State where the prune makes a thrifty growth and yields heavily, there is a lack of saccharine matter in the fruit that deprives it of its best qualities, and when dried a very inferior product is the result. In other localities large juicy fruit will be grown, which decreases heavily in drying. The prime requisites in the prune are solid, firm flesh, that will not ferment at the pit in drying, a rich, fruity flavor and bouquet, and a keeping quality that will stand the test of months or years without serious loss from shrinkage, and those sections which possess the peculiarities of soil and climate which insure these in their greatest perfection are the true prune sections. The drying quality of the prune varies very greatly owing to the varieties of soil in which it is grown. In some localities it will shrink in drying from four to one, while in others two and a half pounds of green fruit will make one pound of dried. The fruit will also vary in different places in thickness and toughness of skin.

The prune is a gross feeder, and wants for its best development a rich and heavy soil, with sufficient moisture to feed it. The foothills of Santa Clara County have long been regarded as especially favorable to the prune, but, as experiments in its growth have been made, other sections have been found that furnish all the required conditions, and while Santa Clara is still, and probably always will be, the center and most important section of this industry, it is not now the only prune county of the State. The most extensive single prune orchard in the State is now in the Salinas Valley, in San Luis Obispo County, on the eastern slope of the Coast Range, near the town of Templeton. In this orchard there are nearly three hundred acres of prunes in one body, containing three hundred and twenty-four thousand trees. Some very excellent prunes are produced in Los Angeles, Orange, San Bernardino, San Diego, Ventura, Alameda, Monterey, Napa, Sonoma, and in the counties of the San Joaquin and Sacramento Valleys, while especially good results have been reported from Tehama, Shasta, Humboldt, Sutter, and Yuba Counties. It is not improbable that in time the different localities of the State will discover certain lines in which each excels, and the production of specialties in that line will result, the fruit from each being known for its own peculiarities.

CHAPTER II.

METHODS OF CULTIVATION.

SOIL AND STOCK.

The soil required for prunes depends largely upon the stock used, or rather, perhaps, the stock should be selected to suit the soil. A light, deep, sandy loam, not too moist, and well drained, is adapted to peach stock, which does well on the sedimentary deposits of the higher valleys. Such soils are warm and light, and experience has proved that peach stock will do better here than on the heavier, clayey lands of the bottoms.

In the heavier soils plum stock does better than peach, and the Myrobalan, or wild plum stock, is the favorite. It is hardy, forms a good union with its graft, and does not sucker as other plum stock will.

The almond stock is a favorite with many growers who have a rocky subsoil, as it does well in such land—even better than the peach.

The preparation of the soil depends largely upon its peculiarities. If heavy, it should be deeply plowed and subsoiled. If there is a hardpan subsoil, this should also be broken, which can be done with any good subsoil plow; in any event the ground should be plowed deep and well stirred up for ventilation. It is well, where practicable, to begin the preparation of the land for an orchard some time before the planting of it. It should be thoroughly and deeply plowed early in the fall, leaving the surface rough and exposed to the air during the winter. This facilitates the access of air to the lower layers and gives vitality to the soil. Following in the furrow with a subsoil plow is desirable, especially in the conversion of old grain lands into orchards, as it breaks up the old hardpan which has probably formed through years of shallow culture. The preparation may continue through the following summer, and, where practicable, hoed crops can be grown, or the land can be left to summer-fallow, care being taken to keep it thoroughly pulverized and free from weeds. If it is desirable to fertilize the land, manure can be applied in the winter, before the trees are planted. If this is not done then, the work should be left until the trees are planted, and the manure should be evenly spread over the surface during the winter, to be plowed under in the spring. Care should be taken to spread it evenly and not mass it around the young trees, unless it is to be applied as a mulch to prevent evaporation after spring cultivation.

If it is desired to plant the land immediately after breaking up, the work should be commenced as early in the fall as it is possible to do deep plowing, and the ground should be stirred to a depth of ten or twelve inches or more, if practicable, and should afterwards be thoroughly harrowed. If it is still early, cross-plow deeply and follow with a subsoil plow, working to a depth of fourteen inches or more. Harrow again thoroughly and the land is ready for the trees.

PLANTING THE ORCHARD.

In laying off the orchard it is desirable to have it symmetrical and to economize the land. A little thought and care displayed at the commencement will save much annoyance in after years, and it is no greater task to have the orchard neat in appearance and symmetrical in outline than to have it in a haphazard condition. There are three objects to be considered in laying out the orchard: symmetry of appearance, economy of space, and facility for future care. Of course the first thing is to get the trees in straight rows, at equal distances apart, and every one thinks he can accomplish this. But there are various methods of disposing of the straight row, and these methods all have their advocates, and each one its advantages. The principal forms are the square, the quincunx, and the hexagonal or septuple. The methods most common in use are the square and the quincunx systems. The most generally adopted is the square system, as the orchard can be changed to quincunx after being planted, even after a number of years' growth.

PLANTING SYSTEMS.

In order that the most approved planting systems may be better understood, they are illustrated to show how the orchard is first laid out, and how the trees look after several years of growth.

The Square System.

This is the most approved method. The orchard is laid off in lines crossing each other, with equal intervals of space, and a tree planted at each crossing of the lines. By the square method, at twenty feet apart, one hundred and nine trees are planted to the acre.

Quincunx System.

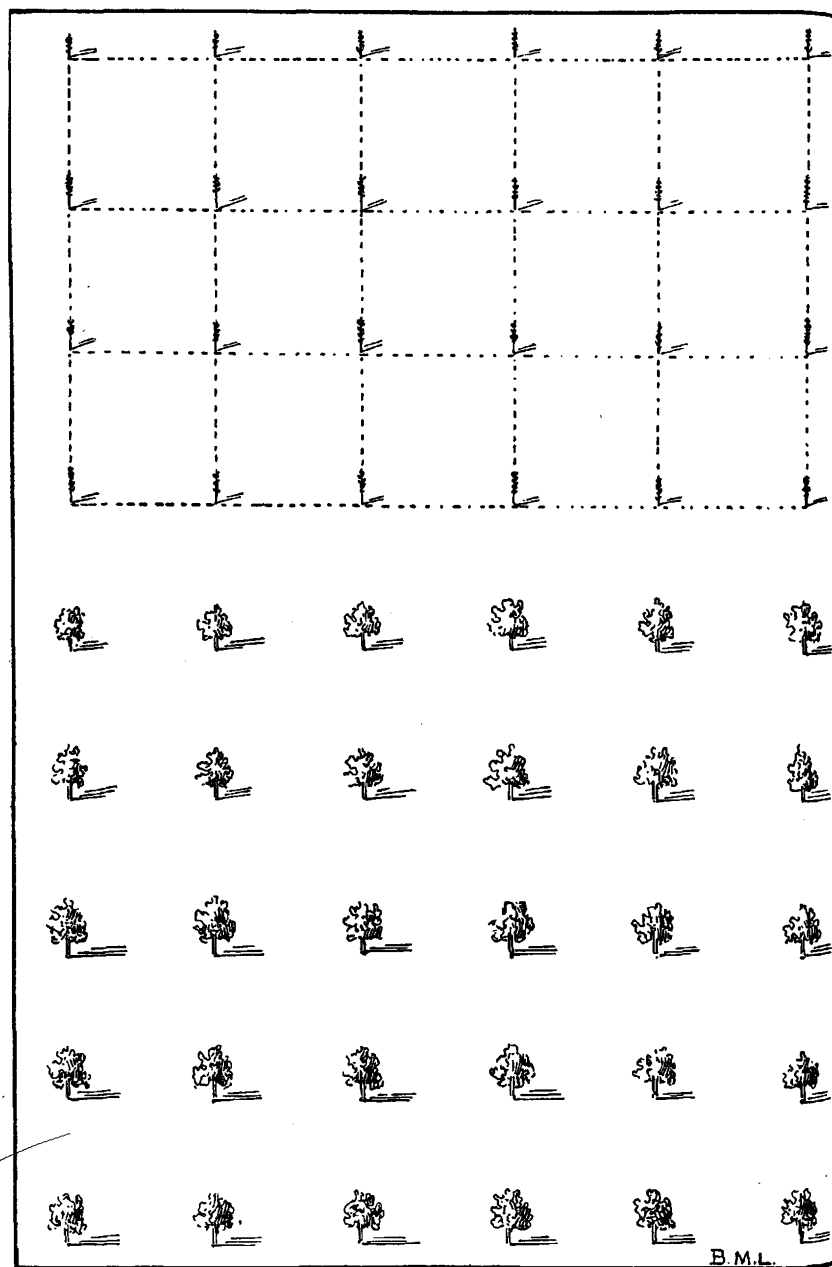
In this system the orchard is laid off in the same manner as for square planting, except that the number of rows are doubled and a tree planted in the center of every square. This method is chiefly used in planting with reference to a future removal of the center trees, which are generally dwarf, when those designed to be permanent shall have attained a considerable size, and the orchard then assumes the square plan. At twenty feet apart, one hundred and ninety-nine trees are planted to an acre by this method.

Hexagonal System.

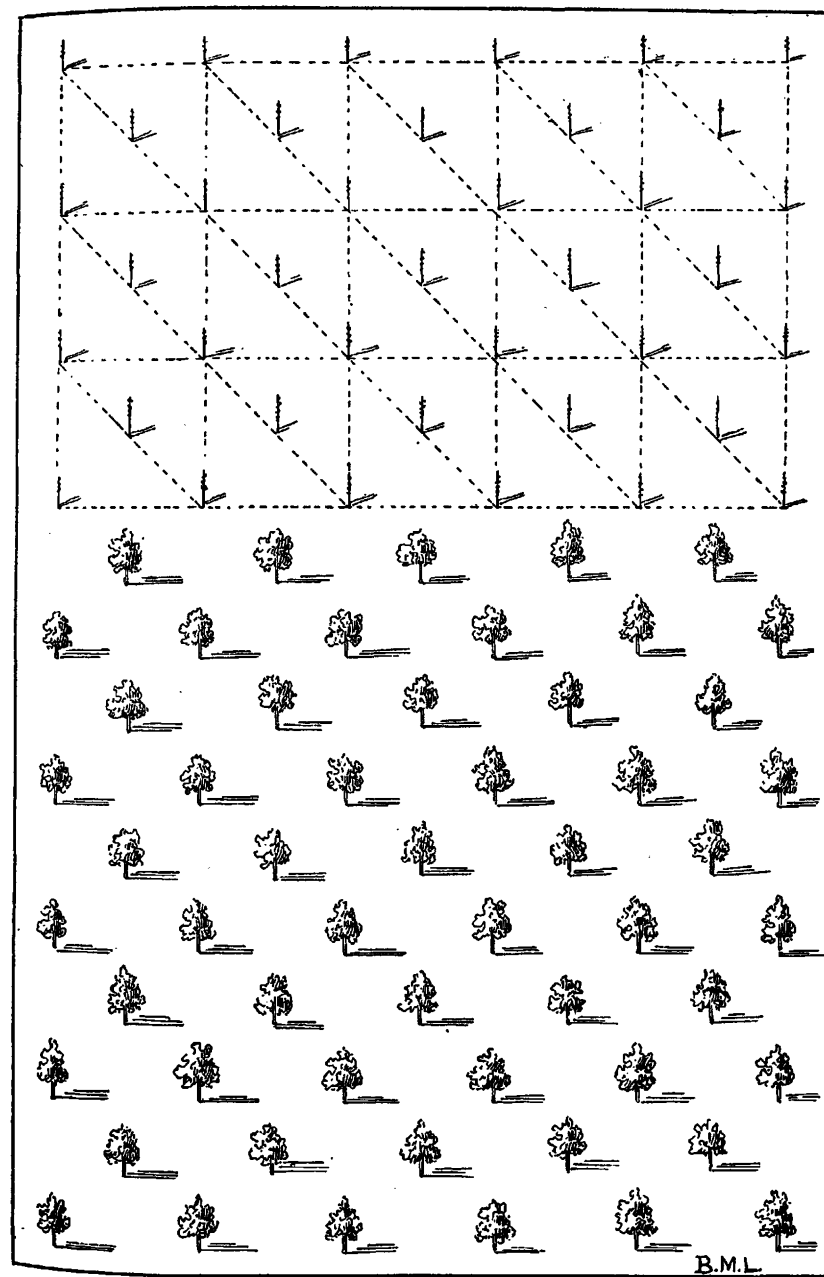
In this system the trees are equilateral—equally distant from each other—and more completely fill the space than any other system can. Six trees form a hexagon and inclose a seventh. The lines in the figure (page 102) indicate the method of laying out the orchard. By this method, at twenty feet apart, one hundred and twenty-six trees are planted to an acre.

Triangular, or Alternate System.

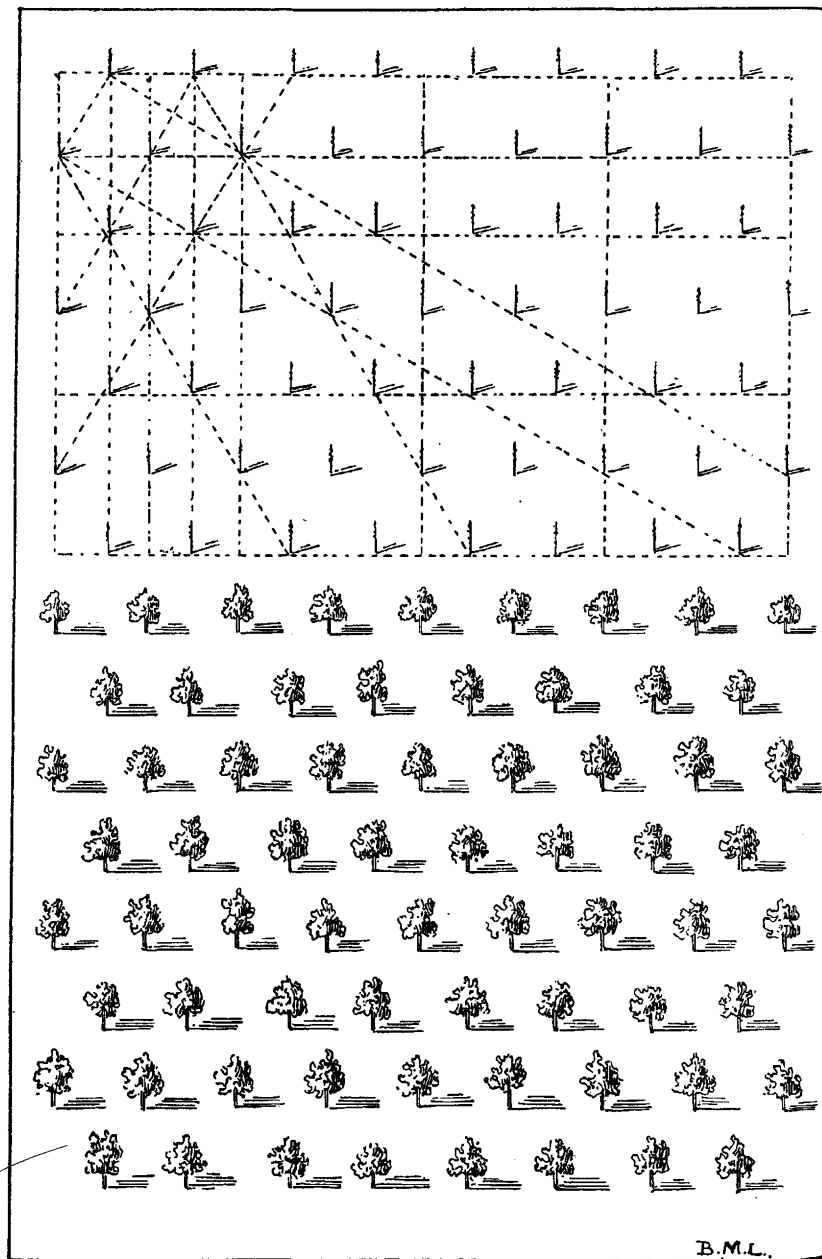
In laying out an orchard by this system, the lines are run forming a square, as in the square system; a line is then run diagonally across, and a tree planted alternately, forming a triangle. The advantage in this system is that the trees are given more space, and can be planted closer together without crowding.



THE SQUARE SYSTEM.

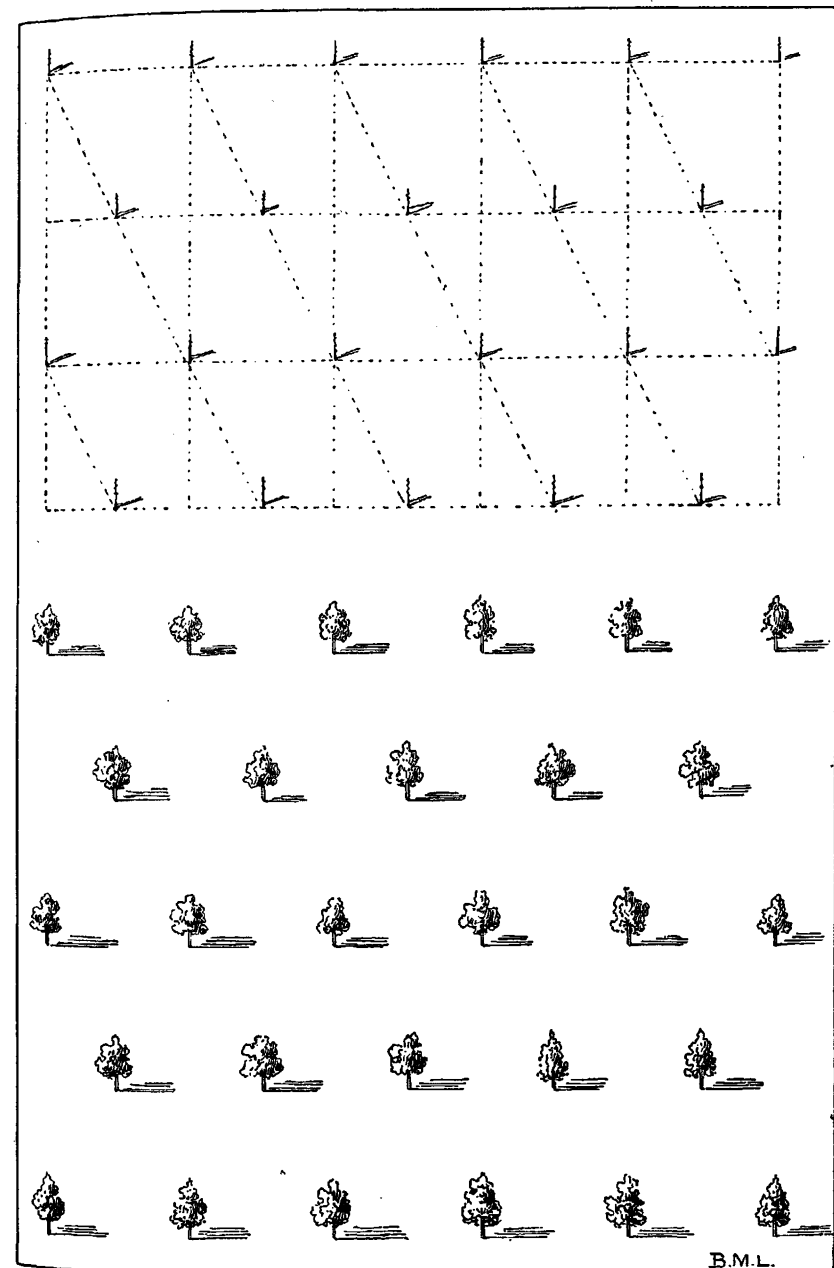


QUINCUNX SYSTEM.



HEXAGONAL SYSTEM.

B.M.L.



TRIANGULAR, OR ALTERNATE SYSTEM.

B.M.L.

The following table will show the number of trees to the acre by the square, quincunx, and hexagonal or septuple systems:

	Square.	Hexagonal, or Septuple.	Quincunx.
10 feet	436	500	831
12 feet	303	347	571
14 feet	222	255	415
16 feet	170	195	313
18 feet	134	154	247
20 feet	109	126	199
22 feet	90	103	173
24 feet	76	86	137
30 feet	48	56	83

NOTE.—In giving the distances of trees of the quincunx, the fifth or central tree is not taken into account.

For any distances not given in the above data, calculate the number of trees to the acre by the square system, and add 15 per cent. This will give the number if planted septuple.

In the proper planting of trees a little admixture of brains is an absolute necessity, as it is in all branches of orchard work. Rules that would apply to one locality and under one set of conditions will fail in another. Some of the most successful orchardists advise the removal of the top dirt carefully, then the digging of a hole of liberal depth and the placing of the surface soil in the bottom; upon this the tree roots are to be set and the hole filled up with top dirt. Where there is a subsoil of cold, heavy clay this plan is admirable, but in warmer, sandy soils it is unnecessary. One of the most experienced prune growers in Santa Clara County advises the throwing out of a dead furrow after the land has been prepared, in which the trees are to be set at proper distances, and the soil thrown back on them with a plow and afterwards pressed closely around the roots.

The more careful method is the best, as it gives the young tree better root hold, and affords a larger area from which to derive its nourishment during its early period of growth.

The distance at which trees are planted in orchard row varies from eighteen to twenty-four feet, twenty feet being the favorite, and under most conditions probably the best distance. On very strong soil the greater distance would be better, as where more closely planted the limbs of the full-grown trees are liable to become intertwined, and to render cultivation and gathering unhandy. At a distance of twenty feet apart, planted by the square plan, there would be one hundred and nine trees to the acre, and by the hexagonal plan one hundred and twenty-six. After planting the young trees should be cut back to eighteen inches from the ground, and they should be protected during the first season from the heat of the sun by a shade on the south side. Three or four buds should be allowed to grow at the top, and the terminal buds of the lower branches should be pinched back after they have grown out a little, so that the buds will put out leaves and shade the stalk the first year.

VARIETIES.

The principal varieties are the California (the Petite Prune d'Agen), the Bulgarian, the Fellenberg, the German, the Hungarian and the Hungarian Date Prune, the Robe de Sergent, the Silver, and the Tragedy.

Of these the first named is by far the most popular, and forms the true shipping prune of California.

California, or P. d'Agen.

[Plate I.]

Branches of middling strength, bent at their very short internodes, of a deep brown on the shaded side, covered on the sunny side with a metallic whitish pellicle, smooth throughout their whole length. Wood buds small, conical, not very sharp, lying in a direction somewhat diverging from the branch, borne on the salient supports, whose sides extend out to some extent; scales of a deep maroon, the outer ones bordered with whitish gray; shoots flexuous, smooth throughout; leaves hardly of medium size, oval-elliptic, or sometimes obovate, ending abruptly in a short point, concave and often slightly wavy in their outline, bordered with teeth deeply cut and rounded, or rather deeply crenated, well supported on petioles of middling length and of middling strength, wine colored and very slightly downy; two small globular, yellow, pedicellate glands attached to the base of the limb of the leaf. Fruit buds medium size, ovoid, not very sharp, gathered on, rather short and rather thick. Flowers rather large, petals rounded, somewhat incised or emarginated at their extremity, divisions of the calyx short, rather large and spread out, pedicels rather long, strong, and smooth. General hue of the foliage a light green, stiffness of all the leaves, petioles of the leaves well spread out and diverging, are the striking characteristics of the tree. Fruit medium size, exactly ovoid, more tapering on the side of the stock than on the side of the pistillary point, around which it is very obtuse, with the cheeks a little more convex than the faces, one of which is transversed by a scarcely appreciable furrow, and the other by a continuation of the furrow deep enough to make the fruit appear as divided into two equal parts. Skin somewhat thick and firm, parting from the flesh, at first of a light purple, tinged with green; at maturity the purple becomes very dark and covered with a thick and bluish bloom. Pistillary point of a golden yellow, attached very close to the surface of the fruit. Fruit stalk somewhat long, not very strong, of a light green, speckled with brown on the side next the sun, inserted in a narrow and shallow cavity. Flesh yellow, fine, tender, rich in sugar juice, but whose aroma is not fine enough to constitute a toothsome fruit raw, but exceedingly good to dry. Pit small, almost exactly ellipsoid, flattened, emarginated at the end adjoining the stalk, rounded at the opposite extremity, with cheeks not very convex, slightly wrinkled, and most often separating from the flesh. Ventral suture widely but not deeply furrowed, with denticulated edges; dorsal ridge not very salient, only somewhat sharp toward the end attached to the stalk, accompanied with fine but well-marked grooves.

Robe de Sergent.

This prune has been classed under various types of prunes grown in several districts of France. Fruit medium size, oval; skin deep purple, approaching to black, and covered with a thick blue bloom; flesh greenish yellow, sweet, and well-flavored, sugary, rich, and delicious, slightly adhering to the stone; a valuable drying and preserving variety. The tree is quite an upright grower, and has a much broader leaf than the Prune d'Agen. A peculiarity of this prune is that it cannot be worked

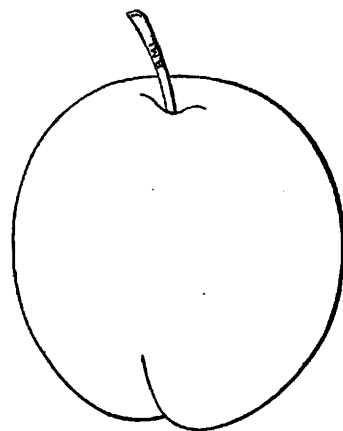


Fig. 1.

on any other but plum stock, except by double working. When budded on peach and almond it sooner or later severs from the stock. The striking characteristics of this tree are bright, shining, large leaves, lancet-shaped, growth strong, not tapering, violet brown underneath, with silvery skin pieces.

Silver.

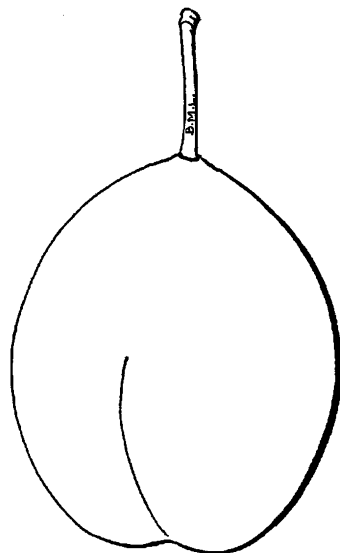


Fig. 2.

Originated in Oregon; it is said to be a seedling of Coe's Golden Drop, which it much resembles. In the judgment of fruit experts, it is entitled to rank with the best drying plums and prunes, because of its large size, handsome appearance, and superior flavor.

Fruit large, oval; a little necked, with one side a little more swollen than the other. Skin light yellow, marked with numerous dark red

spots on the surface side. Flesh yellow, firm, adhering to the stone; sweet and rich flavor. Tree a rapid grower, but does not bear as young as other varieties.

Bulgarian.

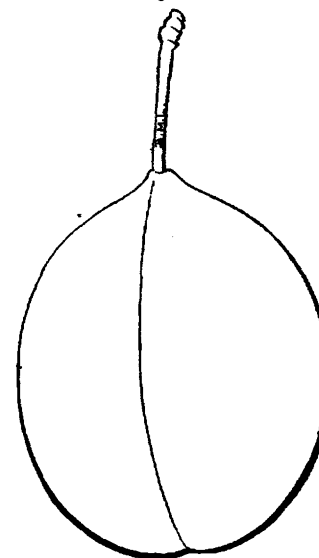


Fig. 3.

A variety cultivated in Alameda County, chiefly in the vicinity of Haywards. Fruit above medium size, dark purple, sweet and rich, with a pleasant acid flavor. Tree a vigorous grower, and an early, regular, and profuse bearer. The fruit is very tenacious, does not drop when mature; valuable for drying.

Brignole.

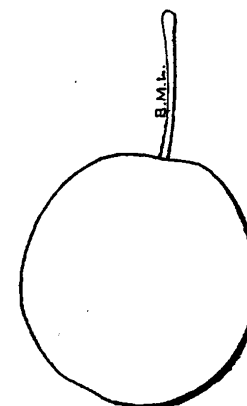


Fig. 4.

Fruit medium oblong; the skin is tough, tasteless, easily removed; color violet, with golden spots on the sunny side; covered with a whitish silver bloom, and spotted all over with light yellow dots; sometimes it

is covered with marks and liver-spots. The meat is greenish yellow, varying to light yellow, tender, and finely grained, very juicy and sweet. The tree is a vigorous grower, and wants warm climate. The big limbs at the upper ends are very crooked; violet-brown color, underside greenish. The leaves are large, egg-shaped. A freestone.

Fellenberg.

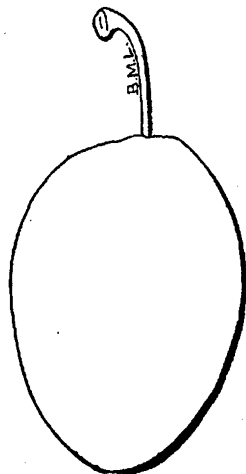


Fig. 5.

Oval, narrower towards the stem. The skin is thick and easily removed; color violet-brown, sometimes violet-blue. Little gray dots are very numerous. The bloom is light blue. The meat is of a beautiful yellow color, consistent. A freestone; very juicy, with a very agreeable sweet and slightly acid taste.

Wangenheim.

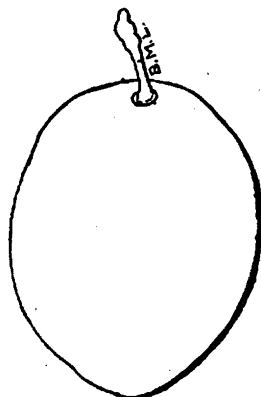


Fig. 6.

Fruit medium size, oval. Skin deep purple, covered with a thick, blue bloom. Flesh rather firm, greenish yellow, juicy, sugary, rich, separates from the stone. Ripens in August.

Hungarian.

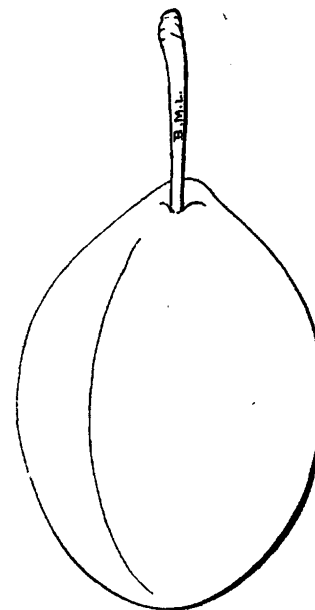


Fig. 7.

Very large, dark red, ovate, tapering towards the stock, inclined to double; juicy and sweet. Its large size, bright color, productiveness, and shipping qualities render it a profitable variety for home or distant markets. Tree a rapid grower and profuse bearer.

Tragedy.

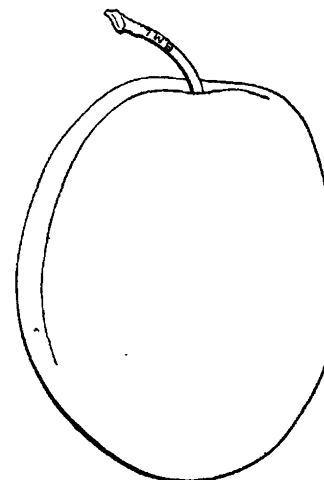


Fig. 8.

A new prune originated by O. R. Runyon, near Courtland, in Sacramento County. Seems to be a cross between the German and Purple

Duane. Fruit quite large—nearly as large as the Purple Duane, looks much like it, only it is more elongated; skin dark purple; flesh yellowish green, very rich and sweet, being sweet from the time it commences to color; frees readily from the pit. Its early ripening (in June) makes it very valuable as a shipping fruit. One of the great points in favor of this prune is that the tree is scale-proof, being, in this respect, similar to the Black Tartarian cherry. The tree is a rapid grower and of beautiful form.

St. Martin.

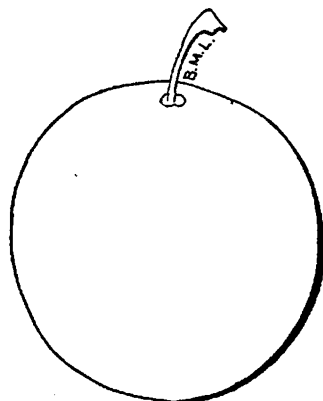


Fig. 9.

A late variety, hardy, and a good bearer; very blunt at the stem end. The skin is thick, tasteless, and can be drawn from the flesh; color yellow, varying to greenish, dotted with red spots. The meat is golden yellow, very sweet, and very agreeable to the taste. A clingstone.

German.

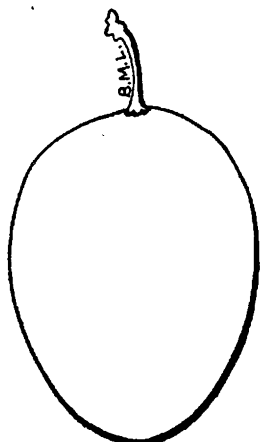


Fig. 10.

Fruit long, oval, and swollen on one side, a little narrower at the point. Skin fine, easily removed, turns dark brown on the sunny side.

Bloom is light blue. The meat is greenish yellow, tender, quite sweet, losing its sweetness through an agreeable acid taste. Separates readily from the stone.

Hungarian Date.

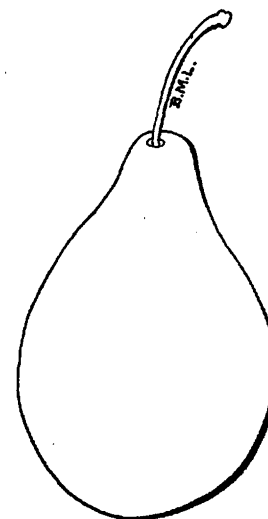


Fig. 11.

The fruit is large, long, rounding, at the stem very narrow. The fruit is thicker than wide; thickest in the middle. Skin is thick and tough, tasteless, and is easily removed; color dark violet-blue, with a reddish shine. On the sunny side there are many red dots and liver-spots. The meat is greenish yellow, coarse, shining, and of a juicy, sweet-wine taste. A freestone.

St. Catherine.

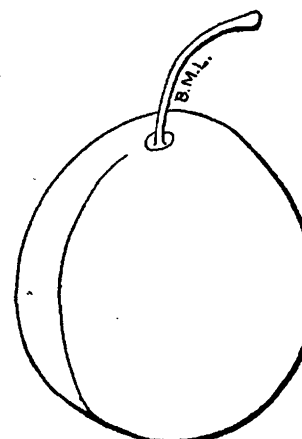


Fig. 12.

Medium size, narrowing considerably towards the stalk. Skin very pale yellow, overspread with thin white bloom. Flesh yellow, juicy,

rather firm, and adheres partially to the stone; flavor sprightly, rich, and perfumed.

Golden.

Originated from seed of the Italian prune, somewhat larger than its parent, of light golden color, exquisite flavor, and good for drying. It is easily peeled and separates readily from the stone, which is quite small for the size of the fruit. The tree is a good grower, an abundant bearer, with heavy dark green foliage.

PROPAGATION OF THE PRUNE.

The first prunes were grafted on plum stock, but this has grown into disfavor on account of the tendency of plums to throw out suckers; and other stocks, the peach, the apricot, and lastly the Myrobalan plum, have come into use.

There is an intimate relation between soil and stock. For light sandy soil the peach stock is yet in great favor, and many growers prefer it over all others. Upon heavier soils it does not do so well as does the Myrobalan. For some time apricot stock was the favorite, but it has now fallen into total disuse. Experience has taught fruit growers a severe lesson. The prune makes a very poor union with the apricot, and when the tree gets to be large enough to catch the wind it invariably breaks off at the joint of the two stocks. In one instance a fruit grower lost one thousand trees in an orchard.

Those who have prunes grafted on apricot root can prevent their loss in the following manner. As the peach makes a good union with both the prune and the apricot, it can be used as an aid: The soil must be removed from the tree so as to get at the union of it. The peach cion must be cut in such a way as to be inserted above and below the union. It will form an arch with the trunk of the tree. On small trees two such grafts will suffice, but on large trees at least four should be placed. These grafts will eventually thicken and form a complete trunk for the tree.

The Myrobalan, or cherry plum (*Prunus myrobalana*), has of late come into great favor as a stock for the prune. It is claimed by some growers that the fruit on Myrobalan stock is smaller than on peach stock, but that its flesh is more solid and dries heavier. The influence of the root on the cured fruit is, however, still a mooted question.

The Myrobalan stock comes from France. It is a wild plum of great thriftiness, and is used very extensively in that country for budding stock of the prune. It grows readily from seed and cuttings, and is easily propagated. The seeds are generally sent to this coast in the middle of October, and then they are at once sprouted. There has been considerable discussion during the last few years as to what is the true Myrobalan, and it must be acknowledged that some of the refined distinctions which have been mooted do not seem to be well placed. Seedlings grown from the seed of the Myrobalan vary, as do other fruit seedlings, both in fruit and in foliage and habit of trees; and perhaps this fact has given rise to the distinction between "true" and "false" Myrobalan, so called. Practice has proceeded without much reference to the discussion, and whether grown here from seed of trees imported long ago, or from cuttings of the same, or whether seedling stocks are



Fig. 13.

Myrobalan plum tree. A. The flower. B. The fruit.

imported directly from France, as large quantities are, the Myrobalan of French origin is now the accepted plum stock for California. It has largely displaced the St. Julien and the Mirabelle, as well as the peach. Though described by some authorities as a dwarfing stock, it is found to be sufficiently free growing in California to suit all purposes, and to form a good foundation for full standard trees. Such prominence has been attained by the stock that we introduce an engraving of the typical Myrobalan tree. Its leaves are smaller and its shoots finer than the cherry plum tree, grown for its fruit in this State.

Whether Myrobalan shall be grown from seed or from cuttings is an open question in California practice. Large quantities have been grown from cuttings, as is the French practice, according to Baltet. Other propagators hold, with W. H. Pepper, of Petaluma, that plum cuttings form a mass of fibrous roots at the lower end of the cutting, and when transplanted fail to send out strong supporting roots. As for the durability of trees grown from cuttings, there can easily be found old, thrifty orchards planted with such trees, though it must be acknowledged a better root system would be expected from a seedling, and there are instances in which trees from cuttings are held to be diseased in the root, while seedling roots are healthy. Possibly longer experience may yield a demonstration of the question.

Experience has shown that the Myrobalan stock thrives in this State both in low, moist, valley lands, in comparatively dry lands, and in stiff upland soils. Thus it has come to be accepted as an all-around stock for the prune.

It is urged against peach stock for damp, heavy soils, that it does not do well; that the sap sours and the fruit will not set well, while the root is subject to root knot, borers, and other pests that do not affect the Myrobalan stock on the heavier soils.

The prune is propagated by both budding and grafting. It is customary to bud the young stock first, as, if the bud does not take, it affords an opportunity to graft later in the season, thus giving the nur-

seryman two chances. The budding season extends from the middle of July to the end of August. The young trees are stripped of their leaves and twigs about six inches above the ground, at which place the bud is inserted. The grafting season is in January and February, at which time grafts are inserted in all the plants in which the buds have not taken. The grafting is done as near the surface of the soil as convenient, usually about two or three inches from the ground. The whole process of budding and grafting is described at length elsewhere in the present report, under the caption of "Propagation," and can be dismissed here without further notice.

CULTIVATION.

In the prune orchard, as in all others, careful cultivation pays. A double object is attained by keeping the surface well pulverized. First, the weeds, which draw heavily upon the vitality of the soil, which should be devoted to tree and fruit growth, are destroyed, and the fertilizing qualities which they would extract from the land are left for the benefit of the growing fruit. Second, it prevents the rapid evaporation of the moisture of the soil, the loose surface acting as a mulch, and on dry lands especially renders the need of irrigation less frequent. Further advantages are found in the neat appearance of the orchard, making it pleasing to the eye, and further, rendering its penetration easy both to teams and men. A neglected orchard, overrun with weeds, takes money out of the pocket of the owner.

It is customary to plow deeply in the early spring, usually as soon as the weeds are fairly started. The seeds of these are given a fair chance to germinate, in order that the plow may turn under and destroy as many as possible, rendering subsequent cultivation much easier. Near the tree rows, shallow plowing must be the rule, taking care to avoid injuring the roots as much as possible. After plowing, the land should be thoroughly harrowed and left in as good condition as it can be made. After the spring plowing a cultivator, or weed cutter, should be run through the orchard from two to four times in the season as may be needed, to keep the weeds down and the surface loose. Particular pains should be taken in the last cultivation to leave the ground beneath the trees as fine and smooth as it can be made. Many growers work it fine with a rake, breaking carefully all lumps, smoothing down all hillocks or inequalities, and leaving a perfectly level and soft surface, upon which the ripened fruit can fall without injury. In foothill land it is usual after the harvest to plow a furrow on the low side of the row, which is left during the winter to catch the rainfall and prevent its escape to the lower lands. By this means the land gets the benefit of the entire winter precipitation, which is husbanded for summer use.

IRRIGATION.

The matter of irrigation is another thing that must be left to the individual orchardist, for it depends wholly upon the character of the soil upon which the orchard is growing. Some lands producing excellent prunes are so damp that drainage has to be resorted to in order to prevent the surplus water from drowning out the trees, while upon others, notably in the southern part of the State, where intense evaporation and dry land are the rule, irrigation must be frequent and thorough,

and careful cultivation must follow each period of irrigation. In portions of the Santa Clara Valley, it is believed that at least twenty inches of rain are necessary to insure good crops, and winter irrigation is resorted to, the land being thoroughly soaked while the trees are in their dormant state, and no water is applied in the summer. Upon this question there is as great diversity of opinion as there is in regard to soil, and each grower must use his own best judgment, taking into consideration the characteristics of the land upon which his orchard is situated. In sections where irrigation is practiced for all orchard crops, the prune is treated the same as is the peach, the apricot, or the almond.

PRUNING.

The training of the young tree requires thought, care, and judgment. In the first three years of its life it is to assume the form which it is to retain during its whole existence. Here again, the individual judgment must be exercised, and conditions of soil, climate, and requirements must be considered. Two schools in regard to pruning have sprung up, each advocating a system diametrically opposed to the other, and each backing its opinions with plausible arguments—the one favoring high pruning, the other low; one heavy pruning, the other light. It is argued in favor of the high-cut tree that it is much easier to cultivate the orchard when a horse can be driven under the limbs, than when it is necessary to work under them with a hoe, as when they are trained low. The advocates of high pruning, in answer to the objections that high pruned trees in hot climates are liable to sun-burn, state that they may be planted closer together and thus afford shade for each other. In favor of low pruning, it is urged that the limbs bending beneath their weight of fruit will find support on the ground, that the trunks are protected from the sun, and that the fruit is easier to gather.

W. H. Aiken, of Wrights, gives the following rules for training the young tree:

"Cut back the trees after planting to eighteen inches from the ground, and shade on south side by some convenient shade. Three or four buds should be allowed to grow at the top, and the terminal buds of those below pinched back after they have grown out a little, so that the buds will put out leaves and shade the stalk the first year. The second year remove them and cut back the limbs to a foot in length; the third, two feet, etc., the object in view being to shape a handsome tree with strength and bearing space, which can be attained only by low training and intelligent pruning.

"After about six years of age, when in full bearing, the tree does not need cutting back as much as it does thinning out of cross limbs, if any, and pruning out unfruitful wood. The sprags or small twigs in body of the French prune tree should be cut back to one or two fruit buds, so that the fruit may be large. Some, however, advise the removal of all such sprags, as the fruit on them is small at the best.

"It is important in pruning to select buds on the upper side of limbs, as they will have a greater weight-bearing power than buds forming branches from under side of boughs. Summer pruning is not advisable. A full season's growth properly pruned back in the winter, and trained low so that the branches take a natural upward and oblique direction,

will shape a tree that will be strong and broad enough to live long and be fruitful.

"My idea of pruning the prune tree is to make a handsome tree with plenty of limbs, and prune it back so that it will give the limbs great strength and bearing space. In that way you can raise a large amount of good plums or prunes. The tree should not be thinned out much unless the limbs cross, because when they begin to bear the tree opens very nicely. I have eight-year old French prune trees, and, though they didn't average it, many of them had eight hundred pounds of French prunes on this year, without much affecting the form or shape of the tree. They were so pruned and so strong, and with such a broad bearing space, that they bore that amount of prunes and very easily, although it has been a dry year, and they were not quite as large as they would have been if there had been a little more moisture. I think the great mistake in raising the prune is leaving too few limbs, say one limb up in the air, and the other one in another direction, like two arms. On such a tree you can raise very little fruit, and it would be of very little profit. I am of the opinion, too, that this pruning should go on each year and give a fine form and strength and bearing space, and when the tree bears and gets to be over six years old, and is in good bearing, you don't need so much pruning back. Indeed, I think when the tree is eight, or nine, or ten years old, it does not need much, if any, pruning back; of course, take out the old limbs to keep it in good form or shape."

Low training and little pruning after the fourth year have grown in favor of late, and are the systems which have the largest support among prune growers. The work of pruning should be commenced as soon as the sap stops flowing, which will depend upon the season, but as soon as the green leaves are gone, and no danger is to be apprehended from "bleeding," pruning may be advantageously begun.

PESTS AFFECTING THE PRUNE, AND THEIR REMEDIES.

Plum Aphis (*Aphis prunifolia*).—These plant lice appear on the under side of the young leaves in spring, and increase very rapidly, so as to cover the new growth in a few weeks. In the last few years this pest has been on the increase. Plant lice, as a general rule, are hard to destroy, owing to their oily excrement. So far whale-oil soap has proved the best remedy. If a tree is badly infested the lice produce such quantities of honey-dew as to make the leaves and fruit very sticky to handle.

Peach Moth (*Anarsia lineatella*).—This insect attacks the young shoots of the tree, bores into the pith, and causes the shoot to wither. Last year it proved very destructive, and caused many a fruit grower to become alarmed. The lime, salt, and sulphur remedy applied in winter checks it to a great extent.

Tree Cricket (*Oecanthus latipennis*).—The limbs of the prune are bored into by this insect, and the eggs are found in the pith. When these crickets are numerous the young limbs become seriously damaged. The best remedy is to cut off all infested limbs and burn them.

The black scale (*Lecanium olea*), apricot scale (*Lecanium armeniacum*), frosted scale (*Lecanium pruniosum*), pernicious scale (*Aspidiotus perniciosus*), are those scale insects which trouble the prune tree most. Some

orchards have not produced good crops on account of having been so badly infested with these pests, the quantity of scale preventing the fruit from growing large and being marketable. The different scale remedies given elsewhere have been well tested and proved to be efficient, provided diligence and pains are taken by the fruit grower when he prepares them.

The following pests are common to the plum and prune in the East, where they have proved very destructive. A vigorous and efficient system of quarantining has so far prevented their introduction on this coast, and little danger is to be apprehended from them:

Plum Curculio (*Conotrachelus nenuphar*).—This pest has been known since 1746, and is an indigenous species feeding upon wild stone fruits. The damage done by the curculio in the Eastern orchards is too well known to require a detailed account here. It is also known that the insect has increased enormously in sections where cultivated varieties are grown. Up to the present time the curculio has not been found in California, and care should be taken to prevent its introduction, as it would ruin our prune industry.

Root Borer (*Ægeria existosa*).—Trees grown on peach stock imported from the East must be carefully examined, and if found infested with the pest must be destroyed. These insects will ruin a tree in a very short time.

YIELD.

The prune is a prolific bearer and can be relied upon for annual crops. Unlike many fruits, it does not take an occasional season's rest, but will yield its average returns every season. If properly cultivated some fruit may be gathered the third year, and the fourth year will yield a fairly profitable crop; the fifth year will give from fifty to sixty pounds to the tree, which the sixth year should double. From this time on the tree can be considered as in full bearing, and will give from one hundred and fifty to three hundred pounds of green fruit annually. The average yield for Santa Clara County is about three hundred pounds per tree. In some instances six hundred to eight hundred pounds to the tree are reported, and one six-year old tree in Visalia is credited with eleven hundred and two pounds of green fruit in one season.

CHAPTER III.

PICKING AND CURING.

PROCESS OF GATHERING.

The prune is picked from the tree when fully ripe, which is indicated when it passes from light reddish to purple, and by the withering condition of the fruit. It is very important that the fruit be thoroughly ripe, or else when dried it will be devoid of that rich flavor so essential in a marketable fruit. In most sections the prune upon ripening has a tendency to drop to the ground, which fruit is gathered and processed with the rest of the crop. The picking of the fruit, simple as the process appears, is one of the most particular things in prune culture. Many of the leading growers go over their orchards eight or ten times, gathering the ripest fruit each time. People are kept continually at work in the season gathering the ripe fruit. Starting at one end of the orchard they will work it over, and by the time they have got through the part first gathered is ready for the second picking, and this is repeated until the entire crop is harvested. The object is to get the fruit in its prime condition—rich, full, meaty, and thoroughly ripe. If it dries a little on the tree and begins to shrivel it is none the worse. The fruit is usually allowed to drop on the ground, from whence it is gathered, and no greater assistance is given it in falling than the gentlest tap on the trunk of the tree; a severe shaking even is not allowed. At the last picking the fruit that remains on the tree is gathered with that which has fallen. By this method the fruit is assured of positive ripeness, is solid, and is charged with saccharine matter so desirable in the cured article. The prune will generally drop from the tree when fully ripe, and will not rot even if left on the ground under the trees for several days. As the fruit shows indications of ripening the ground under the trees is generally cleared of all rubbish and worthless fruit, so that when the mature fruit does fall it can be gathered by itself, free from rubbish. Sometimes a sheet is placed upon the ground under the tree and the ripe fruit is shaken into it, after which the sheet is picked up by the corners and the fruit turned into boxes and loaded on a wagon to be taken to the drying ground.

GRADING AND CURING.

Prunes are usually graded before drying, and various home-made contrivances are employed. Some use inclined planes of adjustable slats, the grader being thus available for other fruits than prunes; the large fruit rolls along into receptacles at the bottom, while the small fruit falls through into other receptacles. Other grading devices are made with wire screens, or riddles of different sizes of mesh. Some of them work on the principle of a fanning mill, three to four riddles

placed above one another, each with a slight incline, and a spout on the side, where each grade drops into a box. Some have a long riddle, say twelve feet long, with three different sizes of wire screen on it. This riddle is hung upon four ropes, with an incline; the prunes are thrown in at the higher end, and by shaking it they roll down and fall through the holes into boxes underneath. The first piece of screen should be small, to let only stems and dirt through, and no prunes. This long hanging screen is also used to grade prunes after drying.

The object to be attained by grading before drying is equality in drying. The smaller fruit dries more rapidly than the larger, and by grading it into two or three sizes, as it comes from the tree, greater uniformity in evaporation is secured, and a more even quality of finished fruit is the result. The grader also removes all twigs, leaves, or other foreign substances which may have become mixed with the fruit in picking.

The next process to which the fruit is subjected is known as dipping. This is one of the most important processes in the whole preparation of the prune for market, and much of the success of the pack will depend upon the person having it in charge. The ripeness of the fruit, the toughness of the skin, and other peculiarities of the fruit, have got to be considered in the preparation of the lye into which it is dipped, so that no certain rule can be laid down. The object to be attained is to remove the bloom, which fills up the pores, and at the same time crack the skin of the fruit so that evaporation may take place more rapidly. In its natural state the skin of the prune is almost impervious, and unless dipped the fruit would consume weeks if not months in drying. The usual strength of the dip is about one pound of concentrated lye to each ten gallons of water. The proper strength, however, must be left to the judgment of the operator, and the lye must be sufficiently strong to crack the skin of the prune. The lye must be kept boiling hot during the operation, and not allowed to cool by the immersion of the fruit. The length of time required for immersion also varies according to the toughness of the skin, the soil upon which the fruit is grown, and the age of the orchard, fruit from old orchards and heavy land being tougher than that from young orchards and freer soils. The average time required is about thirty seconds, but the fruit must be withdrawn as soon as the skin shows minute cracks on its surface. If left too long the sugar will ooze through the cracks in drying, rendering the fruit sticky and disagreeable to handle, and causing it to lose much of its best qualities; if it is removed too soon it will not dry well. After their removal from the lye bath the scalded prunes are next plunged into clean, fresh water, which rinses off all the lye that may have adhered to them in the first operation. This water must be changed frequently to prevent its becoming too heavily impregnated with lye. For dipping, the fruit is put into wire baskets or galvanized pails with perforated sides and bottoms. In the Buxton orchard, at Campbell, in Santa Clara County, a very ingenious device is used which does the work automatically. The prunes are taken direct from the orchard and unloaded into a bin. Elevators raise them to the grader, which removes all twigs, leaves, and rubbish, and assort the fruit into two sizes. These two sizes each fall onto an endless apron, provided with carrying slats, and are carried through the lye baths, which are kept at a boiling pitch by steam pipes, a separate bath being provided for each sized fruit. The

apron continues from the lye bath into the rinsing bath, which is kept fresh by a continuous stream of pure water which flows through it, and from the rinsing bath the fruit is delivered to the trays.

Drying is done wholly by the sun. A number of experiments with driers have been made, but the machines were found wholly inadequate to handle the crops, and sunshine was found so much superior that they have fallen into almost complete disuse, and are now used to so limited an extent as to require no consideration in connection with the prune industry. After the fruit comes from its second, or fresh-water dip, it is spread evenly on trays of a convenient size, usually about two by three feet, made of thin lumber and easy to handle, and these trays are placed on the drying ground, a space which has been carefully selected with a view to its full exposure to the sun. The drying season extends from the middle of August until the beginning of November. The length of time required for the complete desiccation of the fruit depends upon the weather, its heat, and the humidity of the atmosphere.

In hot, dry conditions the fruit requires a shorter exposure than where it is cool and moist. The drying period will vary under these circumstances from a week to a month, and the time at which to remove the fruit from the drying grounds must be left to the judgment of the operator. It should, however, be sufficiently well dried to warrant its keeping under all conditions, but not so dry as to rattle. When sufficiently dried the fruit is taken to the processing house, where it is put into bins to "sweat." This operation requires from two to three weeks, during which period the fruit must be carefully shoveled over several times and thoroughly intermixed. At the end of the sweating season it assumes a black, glossy appearance, and resumes somewhat of its original plumpness.

A very good idea of a California prune-drying scene can be had from the large illustration given herewith, which shows the grounds of Frank Buxton, at Campbell, in Santa Clara County. On this ground, which covers over twenty acres, over ten thousand trays of prunes are dried at one time. From the smaller illustration a good idea can be formed of the way prunes are dried in different orchards throughout the prune sections of the State.

FINISHING.

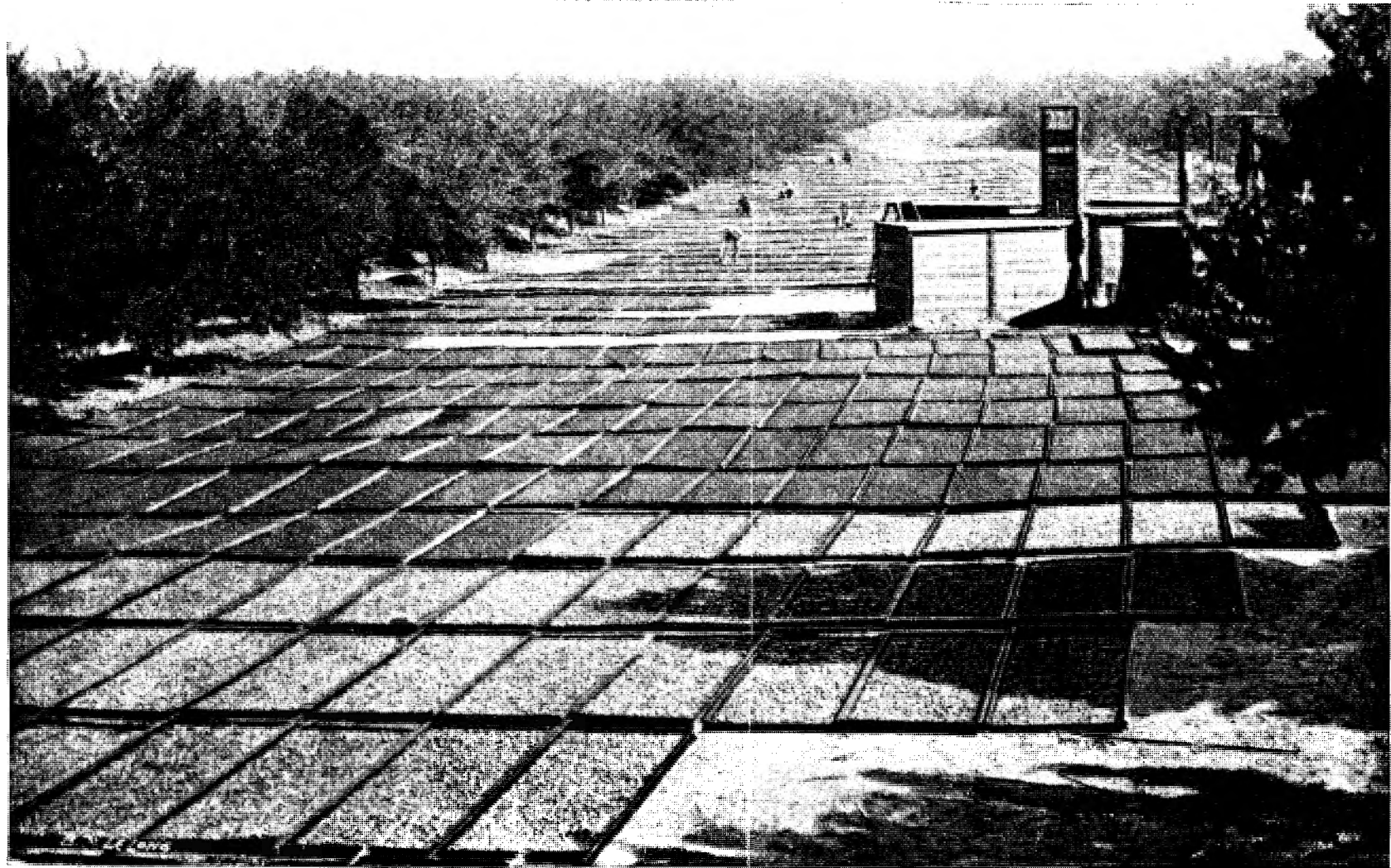
The next process is that of "finishing." This comprises a second bath, to which the now dried fruit is subjected. This bath is simply boiling water, to which is added such ingredients as the judgment or the whim of the individual grower may fancy will improve the appearance or quality of his fruit. The objects to be attained in the second dipping are to destroy whatever insect germs may have become attached in drying, and to soften the skin. The fruit should be left in the bath until partially cooked and these ends are accomplished. Some growers add sufficient salt to the dip to make a fairly strong brine, and this has the advantage of increasing the heat of the water several degrees beyond that to which fresh water can be heated, and making its effect surer. Others add a small quantity of glycerine, glucose, fruit juices, and some few logwood or indigo. This is done for the purpose of improving the appearance of the fruit and adding to its gloss and color. Many of the most experienced packers decry the addition of any of the last named articles, claiming that they are ineffective and do not add



CALIFORNIA PRUNE INDUSTRY.

PRUNE DRYING-GROUNDS OF TEN THOUSAND TRAYS.

CALIFORNIA PRUNE INDUSTRY.



PRUNE ORCHARD IN FULL BEARING, AND DRYING-GROUNDS.

CHAPTER IV.

PRUNES IN EUROPE—PRODUCTION AND MARKETS.

THE FRENCH METHOD.

George W. Roosevelt, United States Consul at Bordeaux, gives the following account of the French method of preparing the prune for market:

"When the prune is ripe it is covered with a sort of glaucous powder, called flower, which greatly adds to its value as a table fruit. As the gathering is an important factor in the subsequent value of the prune, great care and good management are indispensable. The fruit is usually gathered after the heat of the day has dissipated the humidity of the night. When possible, straw is carefully spread beneath the trees to prevent the fruit coming in contact with the earth. The prevailing custom, however, is to harrow the ground before gathering the plums. Only such fruit as readily falls when the tree is slightly shaken is gathered. As soon as harvested the fruit is taken to a building, properly called the fruitery, where it remains for a few days to complete maturity. Prunes are subjected to not less than three, and frequently to four, distinct cookings before being pronounced ready for market. Each of these operations has a special end, in sight of which great care is demanded. The first two preliminary cookings have for object evaporation of water contained in the fruit, and preparation for the final cooking, which dries the fruit and imparts a certain brilliancy much sought after by buyers. Sun-dried prunes are most delicious in taste, but the exigencies of the trade do not permit of such long preparation. In several districts of France most primitive means are practiced in curing the fruit for market. In Provence the freshly gathered fruit is plunged into pots of boiling water, where it remains until the water again arrives at a boiling point. It is then removed from the boilers, placed in baskets, and gently shaken until cool, when it is put upon long trays and exposed to the heat of the sun to complete desiccation. At Digne the prunes are not gathered until completely matured. Women peel the fruit with their nails to avoid injury to the soft pulp. The fruit is strung upon small twigs, and in such fashion as not to touch. These sticks of prunes are stuck into straw frames, which are suspended in the sun, until the prunes easily detach from the stick; the pit is then removed, the fruit placed upon trays, exposed to the sun, and when thoroughly desiccated packed for market.

"In the departments of Indes-et-Loire and Lot-et-Garonne immense ovens purposely constructed for prune cooking are used, but the proprietors often suffer loss from want of more commodious cooking apparatus, especially in windy or stormy weather, when the fruit falls in an embarrassing abundance, and he finds himself without means of immediately curing or preserving it. Most prunes are subjected to a preliminary washing to free them from dust or sand that may have adhered to them

in falling to the ground. After washing, the fruit is exposed to the sun or air on beds of straw, or the trays upon which it is to be cooked, to rid it of all humidity. When dry it is spread in a single layer on the tray and at once submitted to the oven. The trays used in rural districts are quaint affairs, varying in form, dimensions, and construction, according to locality. They are made during the winter months by peasants, are clumsy and cumbersome, and the only excuse for their use is that the peasant cannot afford to buy, and is not skillful enough to make better ones. They are very primitive in their construction, consisting of a frame made of hoop, to which is fastened a wicker-like bottom fashioned from rushes or willow twigs. They hold from twelve to eighteen pounds of green fruit, representing about four or six pounds of prunes. Care is exercised in preparing the oven for the first cooking that the degree of heat shall not exceed 50 degrees Centigrade, and in the second not over 70 degrees. If the heat is too strong an ebullition is produced in the fruit, the skin bursts, the juice discharges, the prune becomes sticky, loses its flavor, and consequently its commercial value. After each cooking, which occupies about six hours, the fruit is removed from the oven and exposed to the air. When the prunes are cold they are carefully turned by women specially charged with this duty. They avoid disturbing the fruit while it is warm, as the touch renders it glutinous, and prevents the juice from congealing. The third cooking is performed at a temperature of 80 to 90 degrees, and occasionally at 100 degrees. This, like the two preceding, should be conducted under most intelligent care. After the third cooking the prunes are sorted, and such as are found imperfectly cooked are again submitted to the oven. The degree of perfection in cooking is obtained when the fruit presents a dark purple color, solid and brilliant surface, malleable and elastic to the touch, and when the kernel is well done and intact in the shell. When these conditions are not obtained the kernel ferments, and alters the entire prune, which very soon molds and becomes worthless. Each cooking should not consume more than six hours. In the last, however, the process is sometimes prolonged, depending upon the condition of the fruit. The fruit loses about 70 per cent of its original weight. The dark color depends largely upon the degree of maturity at time of gathering. The brilliancy of surface has no other commercial value than proving the cleanliness observed in preparation and attracting the attention of buyers. Besides the different usages of the prune as an aliment, it is also employed in producing an agreeable brandy.

"Prunes are divided into ten categories, taking the number of prunes necessary to a pound as a basis, and were formerly classified as follows: (1) Trash or refuse, more than 125 to the pound; (2) small prunes, 120 to 125 to the pound; (3) small ordinary, 110 to 115 to the pound; (4) fine ordinary, 100 to 105 to the pound; (5) superior ordinary, second, 90 to 95 to the pound; (6) superior ordinary, for exportation, or half choice in France, 80 to 85 to the pound; (7) first choice, 70 to 75 to the pound; (8) extra choice, 60 to 65 to the pound; (9) imperial, 50 to 55 to the pound; (10) imperial flower, 40 to 45 to the pound.

"This classification offered opportunities to sell inferior prunes for those of good quality, and to prevent this abuse was changed and simplified as follows: No. 1 represents 90 to 92 to the pound; No. 2 represents 80 to 82 to the pound; No. 3 represents 70 to 72 to the pound; No. 4 represents 60 to 62 to the pound; No. 5 represents 55 to 56 to the pound; No. 6 represents 44 to 45 to the pound; No. 7 represents 40 to

41 to the pound; No. 8 represents 34 to 35 to the pound; No. 9 represents 30 to 31 to the pound.

"When ready for exportation the fruit is pressed flat between two cylinders covered with rubber, and then packed into cases by a special machine called a packer. Many dealers still perform this operation in the primitive manner of foot pressure, which is simple, speedy, and equally as satisfactory. Bordeaux is the principal center of this particular commerce, which is yearly increasing. Besides the large amount of prunes exported to European countries by way of rail, there are about one hundred vessels annually leaving this port loaded with this valuable and succulent product. The most important exportation of this production is to the United States. During the past eight years \$4,553,000 worth of prunes, or an average of \$569,125, have been invoiced through this consulate, as will be seen by the following:

1880.....	\$219,736 68
1881.....	525,052 58
1882.....	369,150 64
1883.....	661,166 69
1884.....	577,480 58
1885.....	792,640 96
1886.....	840,299 19
1887.....	568,366 82
Total.....	\$4,553,884 14

"In the beginning of the prune industry many devices were employed for their proper conservation. The first ovens were very primitive, and the work of preparing the fruit for market laborious. At present there are many different kinds of ovens in use, possessing more or less distinct features, but about the same in general principles. The most generally used are the Bournel and the Marletean ovens. The only ovens in use are of French patent and make."

PRODUCTION AND MARKETS.

The principal markets for California prunes are Chicago and New York, by far the greater portion being shipped to Chicago. Some smaller shipments are also sent to Philadelphia and Pittsburg. From these central points the product finds its way to the retailers, and thence to the consumers of the country. Although but a comparatively new aspirant for public favor, the California prune has forced its way in advance of the imported article, and brings from 2 to 2½ cents per pound more than the French prune sold in competition with it. The proportion of pit and skin to meat in the California fruit is much less than in that of the French article, while the proportion of saccharine matter is much greater. These features give our domestic fruit its great advantage over the imported article. This popularity should be no surprise, as the California French prune is a different article from the imported French prune. Our prunes, as every consumer knows, are more like dates, and when cooked are of a most delicious flavor. Besides this, dealers have found out that the California prune keeps better and longer without sugaring than the imported goods.

The prune crop of 1889 was variously estimated at from fifteen million to eighteen million pounds, and it was sold at fair prices, ranging from 5 to 9 cents per pound, the average in the market being 2 cents

higher than the imported. The crop of 1890 was expected to fall short, owing to excessive rain upon the bloom, and the excessive moisture in the soil, which caused much of the fruit to drop after having attained a fair size. At the end of the season it was apparent that the output was but very little, if at all, less than the preceding year. Prices for green fruit delivered at the driers ranged from \$21 to \$30 per ton.

The amount of prunes now consumed in the United States is enormous, but the consumption is capable of great enlargement as the superior quality of the Pacific Coast product becomes better known. It will be years before the demand on this side of the Atlantic can be supplied, and when that shall have occurred there will be the market of Europe and the rest of the world to supply. The immense area devoted to prune culture this season (1891) testifies to the profound confidence felt in the future of the industry by the people of California, and that confidence certainly appears well founded.

The following table gives the foreign import and California production for the six years from 1885 to 1891, inclusive:

YEAR.	Foreign Imports, by Years, Ending June 30.		California production, by Years, ending December 31— Pounds.
	Pounds.	Value.	
1885.....	57,631,820	\$2,147,505 00	.....
1886.....	64,995,545	2,026,595 00	2,000,000
1887.....	92,032,625	2,999,648 00	1,825,000
1888.....	70,626,027	2,197,150 00	2,100,000
1889.....	46,154,825	1,423,304 00	15,200,000
1890.....	58,093,410	1,789,178 00	12,200,000
1891.....	34,281,322	2,054,486 00	27,000,000

Professor Allen, of San José, speaking of the rapid growth of the prune industry, says:

"The first shipment of prunes was made in 1867, by J. Q. A. Ballou, one of the oldest orchardists in the valley, and was consigned to A. Lusk & Co., of San Francisco; there were about 500 pounds of dried French prunes in the consignment. This was the first shipment of prunes from the valley, and comprised the entire crop. During the fall of 1891 there have been shipped from San José, alone, 19,207,165 pounds. There are at least 2,000,000 pounds more awaiting shipment.

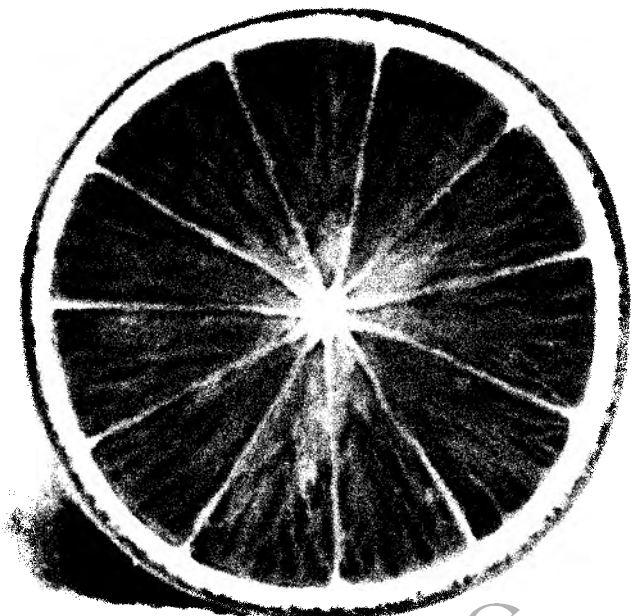
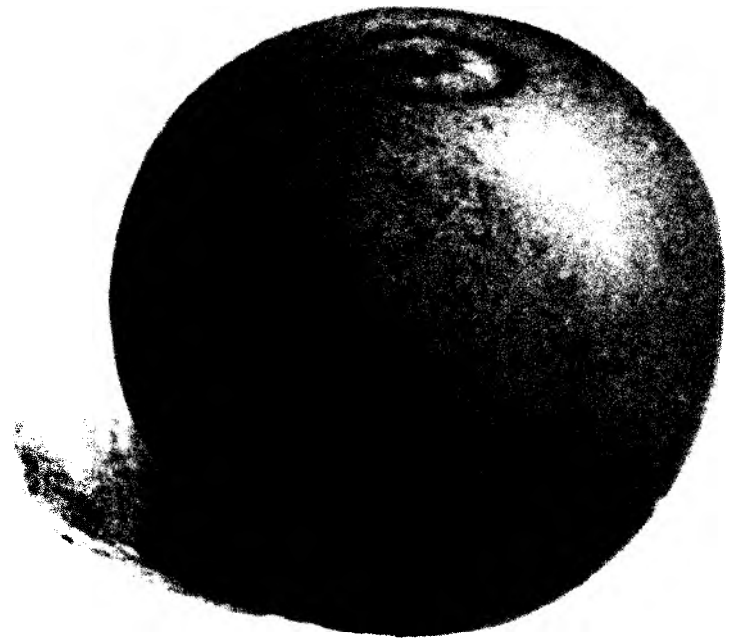
"Mr. Ballou raised his fruit from about fifteen trees, at which time there were not more than one hundred trees in bearing in the valley. Now there are not less than one million, one half of which are in bearing."

The importation of prunes into the United States for the year 1890, to December 31, was 61,905,782 pounds, valued at \$2,819,420, an increase over the importations of 1889 of 18,188,429 pounds, and an increased value of \$584,029. The product of the State of California for the same period is given for 1889 at 15,200,000, and 1890 at 12,200,000, or 28,517,353 pounds less than were imported in 1889, and 48,705,782 pounds less than were imported in 1890. It would appear that while the United States imports from three to four times the quantity of prunes produced by California, there is still a large field for our domestic fruit, and that, with our continually increasing population, the danger of oversupply is still very remote, and prune growing in California may be relied upon as a profitable industry for years, if not for generations yet to come.

PART III.

NEW VARIETIES OF FRUIT, AND METHODS OF
CURING AND ADULTERATIONS.

A NEW ORANGE



THE JOPPA.

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CHAPTER I.

NEW VARIETIES OF FRUITS.

During the past year there were several hundred specimens of all sorts of fruits received at this office, and to enumerate them all would be time and space wasted, as the majority possessed no qualities of any real merit. It is the duty of this department to examine into the relative merits of such varieties and new fruits as come under its notice, and to report such facts of general interest to the public. No sooner is such a report made than we are flooded with inquiries, asking, in the main, as to where and from whom they can be purchased, etc. (information which we must decline to supply), and suggest that in future such communications be addressed to nurserymen. Among those worthy of notice are the following:

PEACHES.

Parker.—Specimens of this peach were received from Poway, San Diego County. The peach is a seedling from the Early Crawford, and originated about ten years ago in the orchard of J. C. Parker, near San Diego. This peach has become quite famous locally, and, I judge from its appearance and quality, will become a popular variety.

Fruit large, oblong, swollen; skin remarkably clear, transparent, and free from down, yellow, with dark red cheek; flesh yellow, red at the pit (an objection for canning), fine grained, juicy, and highly flavored; freestone, sometimes adhering very slightly to the pit. Ripens with or a little earlier than the Foster. Tree vigorous, with abundant stocky branches, usually setting full, but not excessive crops.

This variety is commended as a drying peach, and is said to also possess splendid shipping qualities.

Galbraith.—Originated by W. A. Galbraith, of Santa Cruz. On August 24th I received a box of this handsome peach from Santa Cruz, which, upon examination, showed them to contain qualities which place it among the list of worthy kinds to propagate. It is a chance seedling, resembling the Late Crawford, but of higher color and sweeter. The fruit is large, with very little coloring at the pit, and, when fully ripe, very luscious, and the skin peels off very readily. The tree is a vigorous grower and free from curl. A valuable peach for drying.

Queen of the West.—This is a valuable shipping peach; ripens September 1st. Originated at Lancha Plana, Amador County. The fruit is large, white, with a red blush, and very red at the pit, which is against it for canning purposes. Very highly flavored; a freestone. The tree is a good grower, and is said to be free from curl.

PLUM.

Plantz Seedling.—Originated by W. A. Plantz, of Newcastle, and is a chance seedling. It is a splendid shipper, and ripens in that locality about three weeks ahead of the Hungarian prune. On August 24th

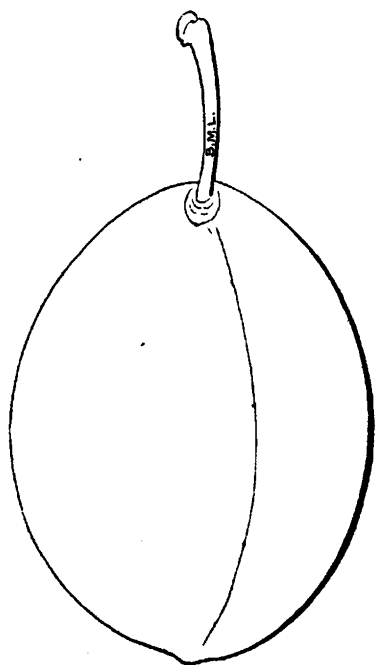


Fig. 1.

last I received a box of these plums, and kept them for eight days without the slightest trace of deterioration. It is, no doubt, a seedling from the Victoria, its resemblance having been fully traced, but of a better quality, and larger and much more handsome in appearance. The tree is a good bearer and a thrifty grower. Fruit large, oval, tapering towards the stock, reddish purple, covered with a light blue bloom; flesh yellow, sugary, rich, juicy, and sweet. The first plums were picked from this tree three years ago, bearing in all about two boxes. Last year it bore six boxes, and this year (1891) twelve boxes and five crates. The pit is perfectly free when ripe. The tree is now about eight years old, and continues to bear quite heavily. It is a valuable shipping plum, and is worthy of propagation.

ORANGE.

Joppa.—A very promising variety; can be marketed early, being sweet from about the time it commences to color, or can be left until May and June without deterioration in quality. Fruit (Plate II) oblong, medium to large, uniform, practically seedless, distinguished by a well-defined corona at the blossom end; thin rind, solid, and free from rag; pulp very fine, sweet, and juicy; resembles the pulp of the Washington Navel. The fruit does not drop from the tree, is very tenacious, and of a deep red color. The tree is thornless, an upright and vigorous grower, attains the bearing surface of thrifty seedlings, and is a heavy bearer. Foliage large, dark green, symmetrical, and very abundant, lanceolate, petiole prominently winged on either side. Originated in 1879 by A. B. Chapman, of San Gabriel, from seeds obtained from Joppa, Pal-

tine, and Mr. Chapman named it "Joppa," in order to indicate the locality of its original home in the Holy Land.

APPLE.

Purcell.—This beautiful apple was originated by Felix Purcell, of Covelo, Mendocino County. It is no doubt a seedling from the Yellow Bellflower, and resembles it strongly; very handsome in appearance,

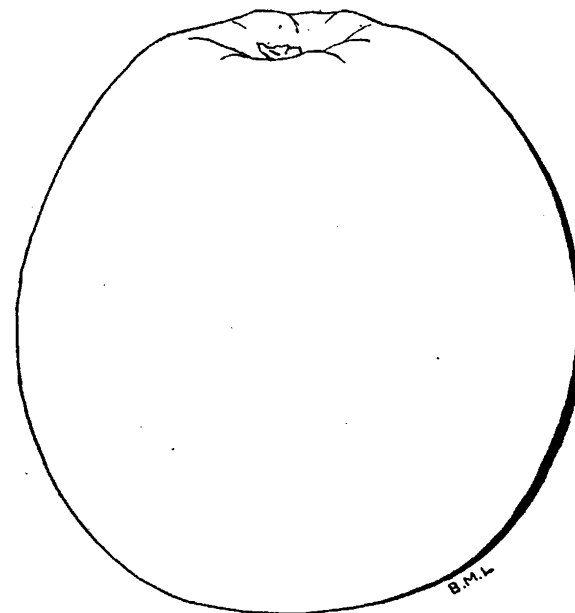


Fig. 2.

smooth and aromatic. Fruit bright yellow, medium oblong, and very regular, tapering towards the blossom end; flesh tender, crisp, juicy, very rich, and of high flavor. Tree a rapid grower and an excellent bearer. A good keeper, specimens in January being very firm.

GRAPE.

Pierce (Syn. *Isabella Regia*), *Plate III.—This grape is destined to become one of the most popular of table grapes known in our State, and will become more so when its merits become better known. It is an exceedingly strong grower and a prolific bearer. The foliage is remarkably large and handsome. Bunches long shouldered and loose. Berries are of extraordinary large size—twice as large as those of its parent *Isabella*; color purplish black, covered with a light blue bloom, and when ripe are exceedingly sweet, delicious, and slightly aromatic, the pulp readily dissolving; seeds small, and smaller than the seeds of the *Isabella*. This grape for the past six years has been known in the market

* Errata in Plate III, read name "Pierce."

under the name of "Isabella Regia," which has been changed to Pierce to avoid it being confounded with the Isabella.

J. P. Pierce, of Santa Clara, has an arbor about one half mile long, which was planted by William Lent, a mining man, about thirty years ago, but originally there were more than two miles of arbor, which Mr. Pierce rooted out. These arbors were planted with American grapes, and among them were a large number of Isabellas. About twelve years ago Mr. Pierce noticed his children trying to reach a bunch of grapes with a stick; this attracted his attention, also, as the bunch and berries were of a very large size, at least three times as large as the Isabella. He then marked the branch, and in the spring following grafted other vines with cions from that branch. The second year the branch produced a number of bunches of extraordinary large size. The following winter Mr. Pierce removed all the side branches to throw all the force into that one branch, which continued to bear the same quality and size of grapes. He then propagated from it quite extensively, and now has about two acres in bearing on their own roots. He has also a great many grafted vines which have done equally as well. No variations have as yet been noticed, they remaining constant bearers. The berries are not quite as strong in musky flavor as the Isabella. The old vine in the arbor still remains, and, peculiarly, one branch bears the Isabella and the other this grape.



CHAPTER II.

ADULTERANTS IN OLIVE OIL.

The question of adulterants used in adulterating olive oil has greatly exercised the minds of consumers, and the fraud having been so largely practiced an investigation was had, and the results of that investigation were really appalling. Merchants and others were found to adulterate olive oil with foreign agents, and sold as pure olive oil. The business was conducted on such a large scale, and so greatly to the detriment of the olive oil industry of the State, that a Convention of olive growers was held in July, 1891, and measures were taken to suppress the outrageous practice.

The State Analyst, W. B. Rising, was appealed to for aid. He promptly responded to the request, and, after a careful investigation, submitted the following preliminary statement:

REPORT OF THE STATE ANALYST.

"One of the important industries of California has been much injured and retarded because of the unfair competition to which it has been subjected by unscrupulous dealers and manufacturers. I refer, of course, to the olive oil industry, and to the adulteration which is generally believed to be very largely practiced.

"When I received from Mr. Lelong, the Secretary of the State Board of Horticulture, a communication asking me to make a study of the methods of detecting adulterations in olive oil, I felt that my duty as State Analyst, and my loyalty to the welfare of this State, demanded that I should do all in my power to solve this question. I realized that the honest oil maker was in great danger, and that he had a right to the best efforts of those who could help him. It is one of the legitimate functions of our State government to protect the honest citizen against the frauds of those who would adulterate any food or medicine for gain. No denunciation or condemnation by the public is too strong for such lawless and heartless pirates upon helpless and innocent victims.

"In a word, the question of *food adulteration* is of the highest importance, affecting, as it does, every person in the whole country. It also has a commercial bearing, discouraging honest industry. Especially is this felt by the olive grower, who tries to build up a great industry for which California is so well adapted. If the olive oil maker can be defended in his rights, in ten or twenty years the industry will have attained immense importance. Already it has been demonstrated that for delicacy of flavor and fine quality we have nothing to fear from the competition of the world. An honest competition we do not object to. We cannot, however, compete with mustard-seed oil, cotton-seed oil, peanut oil, to say nothing of the inferior oils which may be substituted

for the honest oil by unscrupulous adulteraters. The men who as pioneers have built up the industry, may well be proud of the success they have attained. The fact that adulteraters wish to brand their oils 'California pure olive oil,' is all the evidence that is needed to convince any one that our own pure oil is all that is claimed for it.

"The first step toward self-protection is to procure evidence that adulteration is being practiced. This task has fallen to me, partly because of the official position which I hold as 'State Analyst,' and partly, I suppose, because of the appliances and facilities which I can command for doing this work. I entered upon this work with a full appreciation of its importance, and of the responsibility placed upon me. I did not expect any easy solution of the problem. I have not looked for easy or quick methods. I expected that all the skill and training of an experienced chemist would be needed to solve the problem given me. The literature on the subject is simply enormous. Good methods and bad methods, practical and impractical methods, special methods and general methods, are crowded together, and the inexperienced oil chemist neither knows their value nor their use.

"The successful completion of the task assigned me required a careful examination of the various methods suggested, testing each upon pure oils and upon adulterated oils, adopting the useful and rejecting the useless methods. This work was begun and has been carried forward far enough to make a statement of results obtained. I cannot say that the work has been finished, inasmuch as many experiments remain to be made, and many studies begun should be continued; but I do feel prepared to say that the most important methods have been successfully studied and used, and that they give results which cannot be questioned. It is not safe to depend upon any single method, but by using many the imperfections or insufficiency of one is supplemented and explained by the others. My experience has been that there is a perfect harmony and agreement among the various methods used, so that the possibility of mistake is almost impossible.

"It may fairly be assumed that oils of different origin possess a different constitution. By this I mean that olive oil is only obtained from the olive, and cotton-seed oil only from the cotton seed, and lard oil only from lard, etc. Each possesses certain properties which are characteristic, and which are not possessed by any other oils. The solution of the problem, then, depends upon our ability to recognize and determine these characteristics wherever they may occur. Every property of these various oils which can be recognized with certainty is of importance in detecting adulterations. There are many persons who have a taste so delicate and so cultivated that they can detect, with a good deal of certainty, the presence of many adulterants. Lard oil, peanut oil, especially if not well refined, are easily so detected. The color of an oil is not so characteristic, and depends upon less essential qualities, and varies according to ripeness, kind of olive, etc. The expert olive oil dealer and maker becomes accustomed to these properties, and can form a very good opinion of the oil from his own district, which he is accustomed to see and handle. The chemist dare not lay too much stress upon them. He receives them as a hint or suggestion to look carefully for such or such adulteration, but he dare do no further. He must furnish positive and tangible proof, and not impressions or beliefs.

"We may begin our study by taking up the *physical properties* of the oil, and when we have determined the more important and characteristic of these, then take up its *chemical properties*. Under physical properties we may examine its specific gravity, its index of refraction upon light, its viscosity, etc.

"The specific gravity of pure olive oil is very nearly constant at any given temperature. If this can be accurately determined it will indicate pretty certainly the purity or impurity of the oil under examination. This test is worth nothing, is *worse than nothing*, unless made with all the care and skill of a dexterous experimenter. The margin of difference between olive oil and many oils used to adulterate it is not large, but constant. Expressed in numbers the specific gravity of olive oil is .9156 to .9162, cotton-seed oil, .9225 to .9236, peanut oil (commercial), .9209, etc.

"At the outset it may be well to say that the chemist feels bound to get at the *nature of the oil* he is examining, as far as possible, to learn as much of its physical and chemical properties as he can, and then when he has determined all these he collects his results together and compares them with those obtained for pure oils. If the oil contains, as it sometimes may, a large amount of free acid from decomposition, this will change to a certain extent its physical properties. If this is known the explanation is at hand for what otherwise would be or might be misinterpreted. In a word, if we are to solve a problem containing a number of unknown quantities we must have a requisite number of equations. The more nearly we can fulfill this condition the more nearly does our conclusion come to an absolute demonstration.

"The *index of refraction* is a valuable indication of purity or impurity. I have found this index for pure olive oil at 16 degrees Centigrade (60.8 degrees Fahrenheit), 1.4699 to 1.4708; cotton-seed oil, 1.4734; sesame, 1.4735; mustard-seed, 1.4742. The illustrations which I have given are sufficient to show that we have a margin, not large, but still sufficient to give us a good indication.

"The viscosity of the soap made from the oil I believe will be a good indication of purity. This test was first devised by Dr. Babcock, and used by him to detect adulterations in butter. When I visited his laboratory some four years ago, I at once conceived the idea of applying it to the testing of oils for adulterations. Accordingly, when I began this investigation I asked Dr. Babcock if he would be willing to apply the test to olive oils. This he very kindly consented to do, and the results obtained by him agreed perfectly with the tests made in my laboratory, using standard methods. It is too soon to make any positive statement in regard to the use of the viscometer, but this much I do think, that it promises to become a useful method for detecting adulterations in olive oil. I shall subject it to a long and careful series of tests, hoping that I am not expecting too much of it.

"Passing to the examination of the chemical properties, I would mention as one of the greatest importance, the amount of iodine absorbed by various oils. Here we have quite a wide margin, and small amounts of such oils as cotton-seed, mustard-seed, arachis (peanut), rape, sesame, are recognized.

"A pure olive oil may absorb from 78 to 88 per cent of iodine. The oils named absorb more, and so much more that we have no reason to doubt the cause of the large absorption. A foreign oil which possesses

that property is present. Of the many tests which I have made not one has shown any discrepancy from the above statement. If the amount of iodine absorbed was large, it was because cotton-seed or some other oil with high absorption power was present.

"When olive oil is mixed with sulphuric acid of a given strength and in proper proportion, the temperature rises from 33 to 41.5 degrees Centigrade. Numerous experiments have been made with this test, and in all cases these limits have not been exceeded by California olive oil. I have convinced myself that this test is thoroughly reliable in skillful hands. Cotton-seed oil gives a rise of temperature of 67 to 70 degrees Centigrade; sesame oil, 68 degrees Centigrade; arachis or peanut oil, 65 degrees Centigrade; rape or colza oil, 57 to 58 degrees Centigrade. The difference between the highest temperature reached with olive oil and the sulphuric acid, and the lowest given by the cotton-seed, sesame, peanut, or rape, and oils of the same acid, is so great, 20 to 30 degrees Centigrade, that there is little chance of making a mistake. Only adulterated oils can give this high temperature.

"When oils are treated with nitrous acid and allowed to stand for a few hours they show different consistencies, which are characteristic of the oils. Olive oil, lard oil, sperm oil, and sometimes peanut oil will give a *solid, hard mass*. Mustard, peanut, sperm, and rape oils will give a *butter*, while rape, cotton-seed, and sesame give a pasty or buttery mass which separates from a fluid portion.

"The melting point of the fatty acids obtained from oils gives another indication of their nature, and if above 30 degrees Centigrade indicates beyond doubt adulteration.

"*Color Tests for Oils.*—Many oils give characteristic colors when treated with acids of varying strengths and under varying conditions. Nitric acid added to olive oil, and tube immersed for five minutes in boiling water, becomes colorless; rape-seed oil becomes red or orange, cotton-seed the same. I will not here mention the whole list of tests which we have used. I may at another time place in print full and detailed directions for detecting adulterations of olive oil. At this time I have attempted to give a general statement of the methods used, so that a conclusion could be drawn in regard to their accuracy. I will add, however, certain special tests which are more or less well known to the public. I refer to the *Bechi* test for cotton-seed oil. This test has been adopted by Cannizaro in the Italian laboratory, for the investigation of foods, after many and long trials. Many complaints have been made against it, but the real cause I think is to be found in the neglect of proper precautions. The reagent must be prepared with great care and carefully tested with known oils, before applying to unknown oils. In my laboratory we were obliged to prepare several samples of reagent before a correct reaction could be obtained. I feel that the failure of many chemists to get the cotton-seed oil test with the *Bechi* reagent was due to a failure on their part to properly prepare the reagent.

"In conclusion I will say that the study of this subject has been one of great interest, and that I have reached the point where many improvements have already suggested themselves, and I hope that I may be able to test them and to make still others.

"When I finished the examination of the oils received from Mr. Lelong, I asked him to test my skill by making some samples in any

way he saw fit and to send them to me simply marked with numbers. In answer to this request he sent me six samples. These were examined by me, using the methods which have already been discussed, and below will be found the returns which I sent him:

Oils Received from B. M. Lelong.

No. of Sample.	Iodine Absorption—Per Cent.	Increase of Temperature, etc., by Sulphuric Acid.	Melting Point.	Bruhl—Albumen and Nitric Acid.	Hydro-chlorine Acid and Sugar.	Bechi Test.
1	97.09	49.0° C.	-----	D'k orange.	Sesame.	-----
2	102.30	47.0° C.	-----	D'k orange.	-----	Suspicious.
3	96.99	51.0° C.	-----	D'k orange.	-----	Cotton seed.
4	90.24	46.0° C.	-----	-----	Sesame.	Cotton seed.
5	100.31	59.5° C.	-----	Light.	-----	-----
6	78.86	38.5° C.	High.	Light.	-----	-----

"[SEAL]

"W. B. RISING,
"State Analyst for the State of California, Berkeley, Cal."

[The above results show plainly the accuracy of the tests, the report indicating the agents used by me in the preparation of the samples furnished the State Analyst.—B. M. L.]

CHAPTER III.

PREPARATION OF THE LEMON FOR MARKET.

For a number of years extensive experiments have been conducted by lemon growers, with the aim to discover, if possible, a process that would keep lemons until such a time as there would be a market for them. Various methods have been tried, and several growers succeeded in keeping the lemon without shriveling or becoming dry on exposure, and thus the California lemon is fast supplanting the foreign. That the growers have been able to place upon the markets a lemon having all the essential points, as well as quality, as late as ten months after being picked, only goes to show what constant experimenting and energy can accomplish.

The success attained by the different growers has been recorded in our former reports, with the hope that others would profit by their experience and be equally as successful. The chapter upon this topic in the present volume is a condensation of the process as given by G. W. Garcelon, of Riverside, which we published in a special bulletin ("Citrus Fruits," 1891), and is considered of sufficient importance to be reprinted in part.

LEMON HOUSE.

"It is not necessary, unless one has a large lot of lemons, to build a very extensive house. Mine (see illustrations) cost me, with all appurtenances, about \$2,500, and will contain six or seven carloads of fruit, properly arranged, to keep from four to twelve months, and in addition I have in the basement two large rooms which I use for storing and packing, also for box material, etc. Feeling confident that the best success in handling lemons will come from each orchardist making arrangements to keep his own fruit, I recommend all growers of lemons to build a house somewhat after my plan, larger or smaller, according to their orchards. In a few words, a plastered room, or rooms, inside an unplastered but closely boarded and ventilated structure, and a hallway running around these rooms, which serves a double purpose, giving an inside passageway to rooms, and allowing what is most essential, the boxes of lemons (newly picked) to be piled up in the outside passage until they gradually throw off excessive moisture and permit any lemon which has been bruised, through careless handling, or otherwise, to develop imperfections, etc., before the lemons are finally put to their Rip Van Winkle sleep. I would also advise that if the basement is not needed, to set the house nearer the ground and shade with trees and vines, which will keep the temperature down, as it is desirable to keep lemons as near the 60-degree limit as possible. The doors should be made to fit close in the inside rooms; no windows. A few windows, with close-fitting shutters, ought to be placed in the outside structure; board tightly outside and inside rooms; and I now think lathing and plastering

on the inside, with movable ventilator in ceiling, would be an improvement on mine. My rooms were plastered on ceiling, and sometimes moisture from spoiled lemons, which were not properly handled before putting in the rooms, caused the plastering to fall.

PICKING.

"When lemons, on well cared-for trees, are from two and half to three inches in diameter, they should be clipped. There should be a good proportion of the fruit, say one half to two thirds, ready to come from the tree from the middle of October to the middle of December, and it would be best to make two separate clippings in that time, for if you make only one some may be too large and others too small. Some growers clip smaller than I recommend, but the three-hundred-to-the-box size is the most popular. The longer you keep the lemon the more it will be reduced in size; you will have to make allowance for contraction—one third to one half—before it is marketed. Every three to four weeks the trees should be gone over for sizable fruit, until all is gathered. Color cuts no figure, only if the tree is not in good condition, or suitable lemons are not all gathered, my rule will not hold. It has been claimed that the first clipped fruit keeps better than the last, and that there is some of the fruit that is not a true lemon. Now, I take no stock in such claims; the trouble comes either from excessive chill, or from lemons which have been overlooked in former clippings; both will spoil and affect those near them after being gathered. Of course, I do not say that there is not some fruit on lemon trees that, through some, as yet, unexplained reason, will be no good. This is true of all fruit, and is not confined to the lemon, or less to first clipping than the others; only wind and exposure will make more of this fruit in later clippings than first.

HOW TO CLIP.

"The grower should provide himself with proper ladders, which may be extension or self-supporting. First, though, he should secure careful, trustworthy men, who will not think it too trivial to carry out the details which must be observed in order to secure success. Do not hurry them; recollect that, although their time costs you money, you will make more by giving them all the time necessary to do this work well, and should not be hired to pick by box or piece. I have never used rings for measurement, although some growers do. It may be an advantage in getting the exact size, yet there is a disadvantage in the fact that some lemons are ready to come from the tree a little smaller than others; and although purchasers desire mostly the three hundred size, yet three hundred and sixty, three hundred and twenty-four, as well as two hundred and fifty, are good sizes. Also, the gloves and clippers which the workmen have to use with the rings delay the work. The eye of a good workman is all that is needed, and if he is at times at a loss, his forefinger and thumb around the lemon will, after he has the diameter, approximate the size wanted. I like oval baskets holding about sixty or seventy-five lemons, lined with burlap, which may be carefully tacked in the bottom, being sure to cover the heads of tacks with the cloth. *Never clip lemons into sacks.* Fastened to the handle of the basket may be a stout, bent wire to attach the basket to the ladder

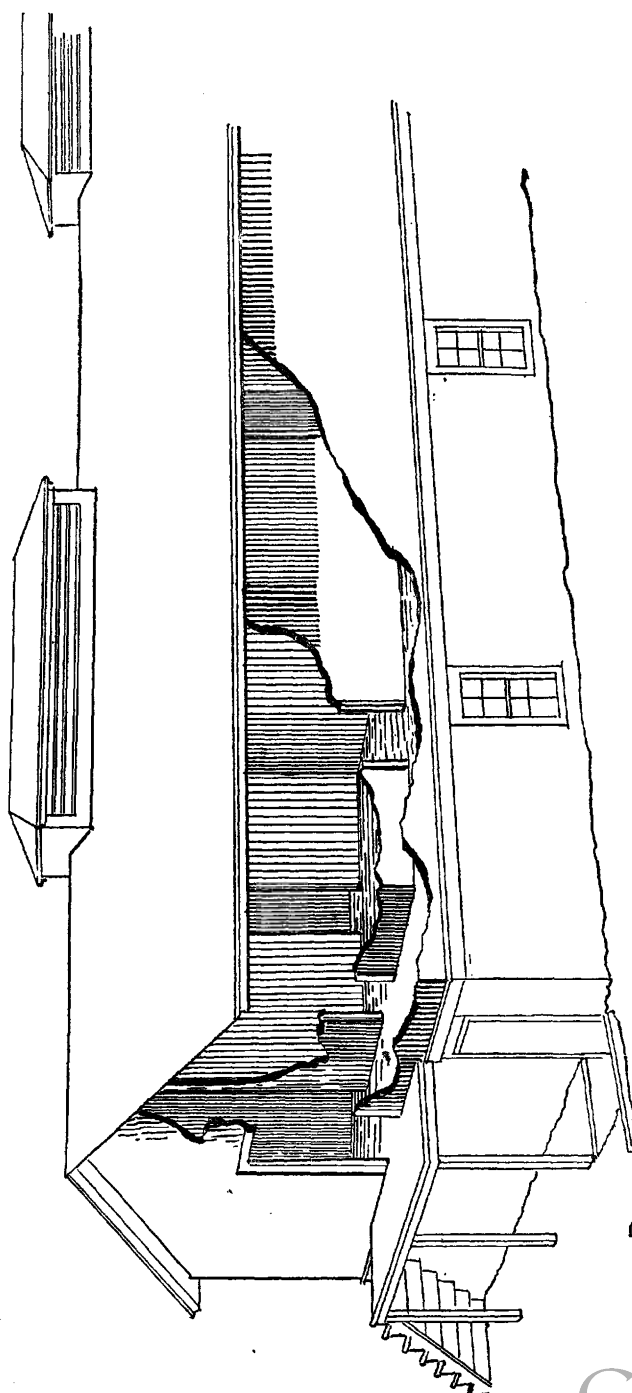
or tree. Never pull the fruit; always clip. Put the fruit in the basket carefully, and when full empty into the picking box, first throwing a loose sack into the box so that it will break the fall of the fruit. The basket being oval, one end is put into the box and then withdrawn, leaving the fruit in the box, and bruising is avoided. Some take the fruit from the basket by hand and place into the box. This is very safe, but time can be saved by my way, but care must be used. After the first basketful is emptied, the loose sack can be gently taken from under the lemons and used for the next. The size of picking boxes is immaterial. I use boxes that are twenty-four inches long, fifteen inches wide, and nine inches deep. Do not expose the fruit to the sun after clipping, and remove it in the boxes carefully the same day into the hallway of the lemon house. When clipping lemons do not leave a long stem, as in handling the stem will injure the fruit next to it.

HOW TO KEEP LEMONS.

"We place our boxes of lemons in the hallway of the lemon house—if in early winter, on the south side; if in late spring or summer, on the north side, next to outside boarding of inside room. The main doors are kept closed and ventilators open, and the excessive moisture will evaporate from the fruit in about four weeks in winter months, and from two to three in summer; then put the lemons away. Now provide yourself with trays just the size of raisin trays, only deeper; the ends should be one and one half inches deep, and nail a lath on each side to keep the fruit from rolling out. I have utilized my raisin trays, and nailed one and one half inch pieces on the ends. Select one corner of a room, which, to prevent loss of space, could be made a little larger than is necessary, for a number of tiers of trays. Under each tier put a closed empty tray—or two would be better, as I find the fruit next to the bottom, as well as the top, cures faster and shrivels more. Upon this foundation put your tray for the first lot of lemons, which carefully empty from the picking box. It would be best to begin two tiers of trays at once, so that the lemons that are left over from filling the first tray with only *one layer* can be put on the second. Of course, throw out, as you come to them, all imperfect fruit. In this way build up your tiers of trays as high as you conveniently can, using your empty picking boxes for staging. Lastly, cover the top trays with one or two tight trays. In this way fill your room and keep your inside doors open for a few days; afterwards close through the day and open through the night, according to the moisture in the room, which should be kept comparatively dry. After the lemons are once put away on trays, and if they have been properly cared for before, and the rooms looked after as I have advised, there will be no need of disturbing them until wanted for packing, even if it is four, six, eight, ten, or twelve months after. A few will spoil, say from 2 to 10 per cent. Although the lemons at first touch each other in the *one layer* on the tray, they will contract so that if any spoil they will not often affect the next ones, and the few spoiling lemons will give a little necessary moisture to the air of the room. This is all. You can look in, from time to time, to notice condition. If a ventilator is put in ceiling of inner rooms, you will have to be careful of draughts, and perhaps use less door opening and closing."

The lemon house is illustrated, and plans given to aid any one desiring to build a similar one, to which attention is called.

LEMON HOUSE AND PROCESSING ROOMS.



PERSPECTIVE VIEW SHOWING INTERIOR

LEMON HOUSE.

3x7

HALL 4 FT. WIDE

ROOM.
18 x 14.6

HALL
4 FT.
WIDE

HALL
4 FT.
WIDE

ROOM.
18 x 14.6

ROOM.
18 x 14.6

HALL 6 FT. WIDE.

4x8

PLATFORM. $\frac{5}{8}$

MAIN FLOOR

The outside of all the rooms is boarded with tongued and grooved boards. The ceilings of all rooms are plastered—two coats—with rough plaster.

PART IV.

PROPAGATION, BUDDING, GRAFTING, AND APPLIANCES.

TABULAR STATEMENT IN REFERENCE TO THE REARING OF DIFFERENT TREES FROM SEED.

TIME OF PLANTING.	DEPTH AT WHICH SEEDS SHOULD BE COVERED.	DISTANCE APART WHEN PLANTED.	TIME OF TRANSPLANTING TO NURSERY ROWS.	STOCKS TO BUD OR GRAFT ON.	BEST TIME TO BUD TO START IN SPRING.	BEST TIME TO BUD TO BE LEFT LIE DORMANT THROUGH THE WINTER.	BEST TIME TO CUT BACK BUDS INSERTED IN SPRING.	BEST TIME TO CUT BACK TO START DORMANT BUDS.	BEST TIME TO GRAFT.
Nursery rows.	2 to 4 inches.	8 to 12 inches.	As soon as the seeds open in February.	Peach, almond, and Myrobalan plum.	June.	August and September.	June.	February.	February and March.
Seed-beds or in drills.	$\frac{1}{2}$ to 1 inch.	Broadcast.	One year.	European and crab species, and any other strong-growing sort.		July to September.		February.	February and March.
Nursery rows.	2 to 4 inches.	8 to 12 inches.	As soon as the seeds show signs of sprouting in February.	Peach and apricot.	June.	August and September.	June.	February.	February and March.
Seed-beds and seed-beds.	1 to 2 inches.	Thickly.	One year.	For standards, Mazzard; for dwarfs, Mahaleb and Morello.		July and August.		February.	February and March.
Nursery rows.	2 to 4 inches.	8 to 12 inches.		American— <i>Castanea vesca</i> , var. <i>Americana</i> .		July and August.		February.	February and March.
Seed-beds and boxes.	$\frac{1}{2}$ inch.	Broadcast.	One year.	Orange—Sweet or sour.	March and April.	August and September.	April and May.	March.	
Drill-boxes.	$\frac{1}{2}$ inch.	Broadcast.	One and two years.	Any strong-growing sort.		August.		February.	March.
Seed-beds or boxes.	$\frac{1}{2}$ inch.	Broadcast.	One and two years.	Orange—Sweet or sour.	March and April.	August and September.	April.	March.	
Seed-beds and boxes.	$\frac{1}{2}$ inch.	Broadcast.	One year.	Sour orange.	March and April.	August and September.	April.	March.	
Drill-boxes.	$\frac{1}{2}$ to 1 inch.	Broadcast.	Two years.	Mission, or Redding Picholine, or wild stock.	March and April.	August.	April and May.	March.	March.
Seed-beds and boxes.	$\frac{1}{2}$ inch.	Broadcast.	One and two years.	Orange.	March and April.	August and September.	April.	March.	
Nursery rows.	2 to 4 inches.	8 to 12 inches.	As soon as they show signs of opening.	Peach and almond for light soils, and plum for heavy or moist soils.	June.	August and September.	June.	February.	February and March.
Seed-beds, boxes, or drills.	$\frac{1}{2}$ to 1 inch.	Broadcast in seed-beds, or thickly in drills.	One year.	Strong-growing sorts—Winter Nelis, etc.—and quince for dwarfs.		July and August.		February.	February and March.
Drill-beds or drills.	1 to 2 inches.	Broadcast in seed-beds, or thickly in drills.	One year.	Myrobalan plum.		July and August.		February.	February and March.
Drill-beds.	$\frac{1}{2}$ to 1 inch.	Broadcast.	One year.	Strong kinds, like Angers.		July and August.		February.	February and March.
Nursery rows.	2 to 4 inches.	8 to 12 inches.		English or Madeira (<i>Juglans regia</i>).		July and August.		March.	March.

on with the peach and almond, which are preferable for light and well-drained soils. The Robe de Sergent should always be worked on plum seedlings, or Myrobalan plum, as it does not unite with the peach or almond. All plum stocks should become short-lived, and are easily blown over.

Seeds that have been allowed to become dry are put into a sack and then immersed in water, and allowed to remain therein (sack and all) for four or five minutes; the sack is then strung up to allow the water to escape. This operation is repeated several times for two or three days or till the seeds have begun to swell; then they can be planted, and the soil must not be allowed to become dry. In case the soil over the seed becomes dry before they germinate, it should be sprinkled with a fine sprinkler, and the extreme surface of the soil broken with a small four-toothed rake. However, great care must be exercised in not disturbing the seed; it is only the surface that requires this treatment to prevent it from baking. In the East they throw the seed, when it has been allowed to become dry, into boiling water, then turning quickly into cold water, repeating the process two or three times, until the hard shell is softened. Apple seeds that have been allowed to become dry, when treated in this way will germinate in a few days after they are planted. Great care should be exercised in the operation; it does not mean that they should be left in the water till the heat destroys their germinating power, but by a short, quick scald and sudden cooling, the heat does not have time to reach the germ.

Apple seeds when buried too deep, especially in damp ground, will soon mold and decay. The soil needs, therefore, to be put in condition essential for their germination.

After a season's growth the plants or seedlings are large enough to transplant into the nursery. The plants are taken up, and then assorted into sizes. Many will then be large enough to graft, which may be done indoors, as will be explained later on. The smaller ones, being quite slender, are transplanted in the nursery; they are then cut back close to the ground, and when they start to grow, several shoots will put forth, which are removed by hand rubbing or thumb pruning, and only one left, which forms the stalk. The rows are generally set five or six feet apart, and the plants four to twelve inches, according to the desire of the grower. The further they are set apart the larger the growth. By fall the stocks will be sufficiently large to be budded.

ALMOND; APRICOT.

Almond.—See method of raising walnut seedlings; also, peach.

Apricot.—See method of raising peach seedlings—the method is the same for the apricot.

CHERRY.

The seeds from the Black Mazzard cherry produce the best stocks for raising standard cherry trees. The raising of cherry seedlings is not very difficult, yet to be successful it requires considerable attention and the following of details closely. Cherry seedlings do not grow as rapidly as the peach or apricot, and the plants are seldom budded until the second year's growth. The fruit is collected when fully ripe and the pulp washed off; the pits are soon thereafter placed in boxes, covered with alternating layers of sand, and thus kept until spring, when they are planted in well-prepared seed-beds, or in nursery rows. If the pits, after being washed from the pulp, are to be shipped to a distance, they should be dried in the shade for a few days to prevent molding, but the drying process should not be continued too long, as exposure to air will

lessen or destroy their power of vegetation. Cherry pits start very early in the spring and should be planted in February, as soon as all signs of frost are over and the ground begins to get warm. The season following, the plants may be transplanted to permanent rows in the nursery.

Dwarf cherry stocks are not extensively used in this State, but in some sections they are preferred. For dwarf cherries the seeds of the Mahaleb are used, and the method of germination is the same as the one previously described for the Mazzard. The Morello stock is also considered very good, and even hardier. Dwarf species are somewhat difficult to bud into; the operation is most successfully performed late in summer, just as the stocks begin to relax in growth.

CHESTNUT.

For the method to be pursued in growing chestnut seedlings, see remarks on raising walnut seedlings.

CITRON.

The citron is propagated from seed and by cuttings. The seed is planted and treated in the same way as orange seeds. The plants grow more rapidly than those of the orange or the lemon, and the plants can be budded the year following. The citron grows and does well on orange stock, and this is the most profitable way to grow them.



Fig. 2.

French method of training the citron for the preservation of the fruits, as otherwise by their weight they would rest on the ground and sever from the limb.

The practice of propagating the citron by cuttings should be discontinued, because the citron roots are subject to the attacks of gum disease, and sooner or later the disease develops in the stocks, and the death of the trees is most certain.

FIG.

The figs grown in this State seldom contain fertile seeds—the kernel is lacking—and therefore their planting should be avoided. The imported figs found in our markets possess fertile seeds and nearly all germinate.

The figs are broken open with the hand and the seeds washed out in warm water. They are then spread out on a piece of paper or board for a little while to dry, or rather for the moisture to leave them. These are sown in April in well-prepared, shallow boxes, as follows: Take fine loam or mold and sift it, and with this mix one half sand; then fill the box two thirds full and press down with a piece of board; then on top scatter the seed and cover with the compost about one half inch deep. The box is then either put in the propagating house or under a frame. A very good way is to sink the box in the ground and place over it a piece of ordinary window glass the size of the box and raised on one side to allow ventilation. In watering, a very fine sprinkler or atomizer must be used, and the bed must be watered very little, just sufficient to keep the seed from drying; the soil below the seed will always be moist enough, especially when the box is sunk into the ground. When the seeds begin to come up there will also be weeds, but the fig plants are easily distinguished from them; the former are removed with the hand, not by pulling but by simply pinching them at the base, thus preventing the fig plants from being disturbed. The plants are taken out of the boxes after the first or second year's growth, and planted in nursery rows.

LEMON.

The lemon seed is planted, and receives the same treatment as the seed of the orange. The raising of lemon seedlings, however, is not practiced, because the stocks are subject to gum disease, and for this reason have been discarded. However, lemon stocks grown from seed make better trees than those propagated by cuttings. The roots are somewhat healthier, but neither are recommended.

The lemon is budded on the orange, and grows thriftily and becomes a prolific bearer. The orange stock is less liable to gum disease, and does not influence the top to any extent as to be noticeable in the fruit. At first the lemons will be inclined to be roundish, but as the trees grow older will assume their elongated shape. The orange stocks are much hardier, and more able to support the heavy weight of the fruit and foliage.

The lemon grows readily from the cutting. The cuttings are planted in early spring and through the summer. The smaller the cuttings the better, but they should not be too small. The wound in small cuttings soon heals over, and they make healthier trees than those from large cuttings, but in either case they are short lived and should not be planted.

LIME.

The lime is very easily propagated from seed. The seeds always germinate without much difficulty. The fruit is placed in tubs or barrels to rot, and then is washed out, preserved, and planted the same as orange seeds. The plants are transplanted the season following. The seed-bed or boxes must be well protected from frost, as the plants are very sensitive, and on account of their being so susceptible to frosts, the lime is not grown successfully excepting in warm belts and sheltered localities. The lime comes true from the seed, the seed "sport" only in exceptional cases.

OLIVE.

The propagation of the olive from seeds is perhaps the most difficult, for various reasons. The pits are quite hard and require sometimes two years after sowing to germinate. In Italy the growers soak the pits in a potash solution for two or three days, and it is said that when thus treated they germinate the same year in which they are sown. The practice in this State is to reproduce from cuttings, and no particular attention has been paid to raising the plants from seed. It is claimed by Italian and French authors that raising the plants from seed is the most natural system, and the one producing the most healthy and robust plants; but they admit that trees grown in this way require more time to bear fruit than those propagated from cuttings. Trees grown from seed seldom produce fruit in less than eight years, and furthermore, they must be budded or grafted, and they must be at least four or five years old before this operation can be performed.

The majority of the pits of the Mission olive do not contain kernels, therefore it is advisable to use the pits from any other variety having kernels. It is not necessary that the olives (from which the pits are taken) be of those possessing high qualities for pickles or oil, but it is important that the tree be of a thrifty sort. The fruits of the Redding Picholine contain perfect kernels, but the tree being a small grower it is not advisable to use this seed, as they may produce plants of a still smaller habit. The seeds having been freed from the pulp, are washed in water—containing some lye or ashes—to free them of all the oil adhering to them; they are then washed in clear water, and after drying in the shade are mixed with sand and put into boxes to be kept till the following spring, to be then planted. The sowing is done in February or March. The use of lye is necessary to render the shell of the pit a little less compact, in order that they may be penetrated by moisture. The lye roughens the shell and thus gives access to humidity.

As olive seeds do not all germinate the first year of sowing, it is advisable not to destroy the seed-bed until the end of the third year. The pits often continue to germinate in certain quantities for over two years.

The pits may be advantageously split, not by using a hammer, but always an iron vise. The longer part of the pit is placed between the jaws of the vise, and by closing tightly the screw the shell is split. It is not necessary to take out the kernel—on the contrary; it is better to leave it in the cracked shell.

The seeds are planted in March, in ordinary seed-boxes, with the bottoms perforated to admit of good drainage. The box is then filled with fine earth (sandy loam) to within three inches of the top, then a half inch of sand is spread, and on top of the sand the kernels are spread and covered with two inches of sand. The boxes should be kept moist and shaded for awhile. This method obviates the necessity of soaking the pits in lye to deprive them of their oily coverings, and a person can easily obtain some six hundred or more kernels in a day. The plants are left to grow two years in the seed-beds or boxes; they can then be transplanted in the nursery, and when large enough can be budded or grafted.

ORANGE.

The orange is very easily propagated from the seed. For this purpose windfalls, culls, etc., are used, but should be thoroughly ripe. The fruit is put into barrels to rot and the seed is washed out. A coarse sieve is used, the decayed pulp passing through the wire, leaving only the seed in the sieve. The seed of the orange should not be allowed to get dry after being taken from the fruit. The seed as soon as possible after being separated from the pulp, is either sown or mixed with sand and kept in boxes in readiness for planting. The seed can be sown in and kept in seed-beds, which should be well prepared with fine soil or mold. The seed is planted thickly and broadcast, and covered with fine earth from one to two inches. The best time to plant orange seed is in March and April. If planted before March they have to remain in the damp, cold ground till the time of germination, and many decay. Orange seeds do not germinate until spring; it is, therefore, better to plant the seed when the ground becomes warm and all danger of frosts is over. The seed-beds should be kept moist but not too wet. The season following, the plants are transplanted in the nursery. The plants are taken up and assorted into sizes; the larger ones are planted and the small and slender ones are set in shallow boxes and kept another year, they being small, quite slender, and very delicate, are scorched by the sun when planted in open ground. The plants are set in the rows twelve to eighteen inches apart, and the rows six feet apart; this gives ample room for cultivation, and for balling the trees when digging them, when the time for transplanting to orchard comes. Planting close in the nursery tends to make slender trees. After the plants have grown a year in the nursery they may be trimmed, provided they have made good growth, say in February, and left to be budded.

PEACH.

Peach pits are perhaps the easiest to germinate, and almost any person can make a success in raising seedlings by observing a few of the most important rules applied to their propagation. The best seed, or pits, are from seedling trees, or, as they are termed, "natural fruit." The practice in this State is to buy the pits from driers and canneries, collected from all sorts and sources. The result is that a very large amount of pits is required, as only about one third (or even less) germinate. The cause of this is that pits from such fruit are generally defective, and many of the varieties sought for by the drier and canneries are subject to "splitting" at the pit, which do not germinate, the germ rotting after the pits are planted. There are many varieties of California seedlings having perfect seeds, but as the driers and canneries do not separate them the grower must take his chances in obtaining good pits from such sources.

Pits from seedlings, or natural fruit, are always the best; they are not subject to splitting at the pit and nearly all germinate, and the plants become the most thrifty stocks. It is contended, and justly so, that the longevity of the tree is dependent in a great measure upon the healthy condition of the seed. The seed of seedlings, or natural fruit, is more vigorous and most certain to germinate, and there can be no doubt that the trees will live longer when grown under such conditions. The

union of the two halves or valves of the pits of seedling fruit is very close and tenacious, while in pits of budded fruit it is often slight and imperfect. The kernels of pits from natural fruit are generally quite hard, close, and nutty, while in those of budded fruit they are often defective in form and the two halves frequently separate in handling. I am not aware of any orchard where trees of natural fruit are maintained for seed, and as the cultivation of the peach, principally of fine sorts, has been so much extended, natural fruit is not easily obtained.

As the growers will have to produce most of their stocks in the future, it would not be amiss for them to plant seedling trees, and maintain them for the specific purpose of producing seed.

The pits should not be allowed to dry after being taken from the fruit; they should immediately be put in sand or layered in the ground, to prevent the germ from drying. Often pits are planted that have become dry, and do not germinate the year they are planted, but will sprout the season following, if allowed to remain in the ground undisturbed. Great care should also be observed that the pits are not put in large piles after being taken from the fruit, but they should be spread out, to allow the moisture among them to disappear. Often they are put in large piles, and left in those piles for several days, during which time fermentation of the acid from the fruit takes place, and the germ of the kernel destroyed.

There are several methods in use for layering the seed. The most common one is to layer the pits in a well-prepared seed-bed in the fall. The place selected for the seed-bed should be in soil free from standing water during winter, as the seed is to remain until spring, and a superabundance of moisture tends to destroy their germinating power. The place where the seed is layered is marked with stakes, to indicate where to dig when the time comes for planting in the spring. A seed-bed is made ranging all the way from four to eight feet wide, and as long as one chooses. The earth is spaded away for a depth of six to eight inches, and the pits spread indiscriminately about four to six inches thick, and then the earth is spread on top, covering them for four to six inches. They are allowed to remain there until early spring. In some places they begin to germinate very early, and later in others.

Another method is by spreading the seed thickly about four to six inches deep, and then spading in about six inches deep. This completely mixes the seed, and it is covered in the soil. In either method the seed must remain in the ground until spring, when the shells are so far loosened that in handling they separate from the kernel. The kernels are at that time swollen, and many will be found sprouted. They are then ready to be planted in nursery, and care is required in their handling, as carelessness will break the tender roots of those sprouted. The planting of the seed in permanent nursery rows in the fall is also practiced, but is not recommended, as the seed does not come up evenly, and prevents the ground from being worked after rains, etc.

PEAR.

The remarks on the importation of apple seedlings apply to pear seedlings as well. Pear seeds are not so easily obtained as apple seeds, not because there are not enough pears produced, but because they are peculiarly liable to prove defective. Seeds gathered from the Winter Nelis

pear have, so far, given the best satisfaction here. Growers have reported repeated failures in having pear seeds from dealers germinate. This is, no doubt, because they are gathered from all sources, care not having been taken to prevent the germinating power of the seeds from becoming destroyed, in allowing the fruit to ferment before separating the seeds from the pomace; acetous fermentation takes place and the germ in the seed is injured by the acid. Another reason is that the seeds are extracted from unripe fruit, and are necessarily imperfect. Pear seeds are injured in many ways, but the principal ones are: being kept too moist for a long time, and by allowing them to become too dry. Pear seeds soon after being collected from the pulp should be separated from each other by mixing with sand. The seeds are taken from the fruit as soon as it becomes quite soft, by sifting them from the pomace, and before becoming dry, or immediately thereafter, are mixed with two or three times their bulk of sand, and are thus kept until spring to be planted. The seed should be planted in February or March, in seed-beds or in drills. After the first season's growth the plants are taken up and assorted, and then planted in nursery, or the larger ones may be grafted indoor, and then transplanted.

PLUM.

The plum used for stocks can be propagated in two ways, *i. e.*, by planting the seed and by cuttings. There are several varieties of plums that can be used for stocks, but the Myrobalan, or cherry plum, has proved the best adapted as a stock for plums and prunes. There are other varieties that can be used equally as well, were it not that they put forth numerous suckers, so much so as to render the stock in time valueless. The Myrobalan plum does not sucker, and thrives in moist soils which are heavy and hold the moisture too long for other stocks, such as peach, apricot, almond, etc., to thrive. It also thrives in dry soils, but it is best adapted for heavy soils, such as are suitable for the pear, or in situations which are too wet for other fruit trees. However, many have fallen into the error, because this stock is so enduring, of planting it in soils too poor to be altogether suitable for its culture, and on this account the trees have not reached perfection or become profitable bearers. This tree, as do all others, requires the elements and conditions suitable for its culture, but will endure many more hardships, and where the better conditions are supplied its returns are according.

Plum pits are kept in sand until spring, when they are planted either in seed-beds or in drills.

QUINCE.

The quince is readily propagated, either by planting the seed or by cuttings. The latter method is, however, mostly practiced, it being accomplished so easily. The seed should never be allowed to get thoroughly dried before it is planted. As soon as taken from the fruit it should be preserved in moist sand until spring, when it is planted in a well-prepared seed-bed, or it may be sown in drills, as pear and apple seeds. Quince seeds are not very easily obtained, as the fruit is not grown in such large quantities as the apple and pear to afford the gathering of culls, etc., from which to extract the seed. The fruit, if obtained, must be cut to extract the core in which the seeds are. They

cannot be left to rot, as are apples and pears, as decay sets in too slowly; and while many quinces commence to rot very soon, yet one side generally remains intact, and to wait until that part decays would be too long for the seed to remain in the mass of sour and fermented pomace, which destroys their germinating power. Propagating by the cuttings system has so far been the most practiced, and almost exclusively.

The system of multiplication by cuttings is probably the best for the quince. The cuttings grow very readily and make thrifty growth, and can be budded the same year of planting. The cuttings are taken from the trees early in the fall, and are planted in January or February, or even later, but the sooner they are planted the better, as the quince puts forth quite early. Large cuttings take root equally as well as the small ones, but the small ones are preferred, as they make a thriftier and healthier stock. Large cuttings have the disadvantage of requiring at least two years of growth for the formation of a complete root system. Often a large cutting is taken up the winter after planting with the end only partly calloused, and the part where rootlets have not begun to form generally dries or rots away, the rootlets then only forming on one side of the cutting. In small cuttings a root forms at the end, and the cut soon grows over; the small root pushes its way downward, and throws out numerous laterals, which give the cutting a system of roots equal to trees grown from seed. The cuttings are made twelve inches or shorter, preference being given to those measuring from one quarter to one half inch thick, and twelve inches long. They are planted deep, allowing only about two inches of the cutting above ground, and after the soil is well pressed around them the loose soil is hoed against the cuttings on either side, covering the parts exposed to prevent the sun from scorching them, and thereby causing the ends to die back. When the cuttings put forth, the little shoots make their way through the loose soil. It is better to allow all the shoots to grow undisturbed for a time, as the trimming prevents the development and formation of roots. Generally a cutting puts forth several shoots, and in a month or so the most of them seem to stop growing, while one or two take the lead and keep on growing; these are the ones to leave, and which become the stock. When those shoots are seen to take a start ahead of the rest the others can be shortened, but should not be cut off entirely, as they aid materially in keeping the sap flowing, acting as suction forcing the sap to the shoots. If the suckers are removed too soon this may give the cutting a too sudden shock, and check its growth for the season. In such event the cutting might as well be pulled up, as it will only remain in the ground lingering between life and death, and, if allowed to grow, will never make a thrifty tree.

Layering, which is a very simple operation, consists simply in bending the limbs down and covering them with earth for a season, and cutting from the parent the season following. When the limb is bent down it is always advisable to cause it to partly break, or twist it; this will help in the rooting. The bark is sometimes cut nearly around the layers just below a bud, to induce the formation of a callous, from which roots are emitted. Quince trees when grown bushy put forth numerous shoots near the ground, thus affording a good opportunity to put down layers. The best time for layering is in the spring, before the trees begin to start.

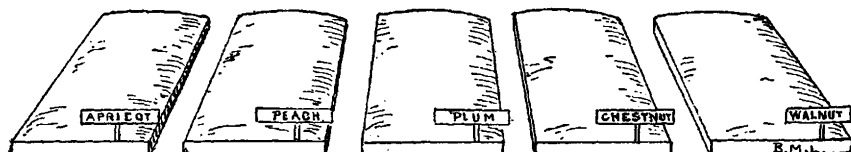
WALNUT.

The growing of walnut seedlings is simple, but requires care and attention in all the points bearing on their germination. The nuts are placed in sand, preparatory to planting, as follows: A frame consisting of ten-inch boards is placed on the surface of the ground and half filled with sand. The nuts are then spread thickly (a layer of nuts six inches deep), and covered with about three or four inches of sand. An embankment of earth is made all around the frame to prevent the nuts from drying. The nuts are examined from time to time, and as soon as they indicate or show signs of germination are planted in nursery rows.

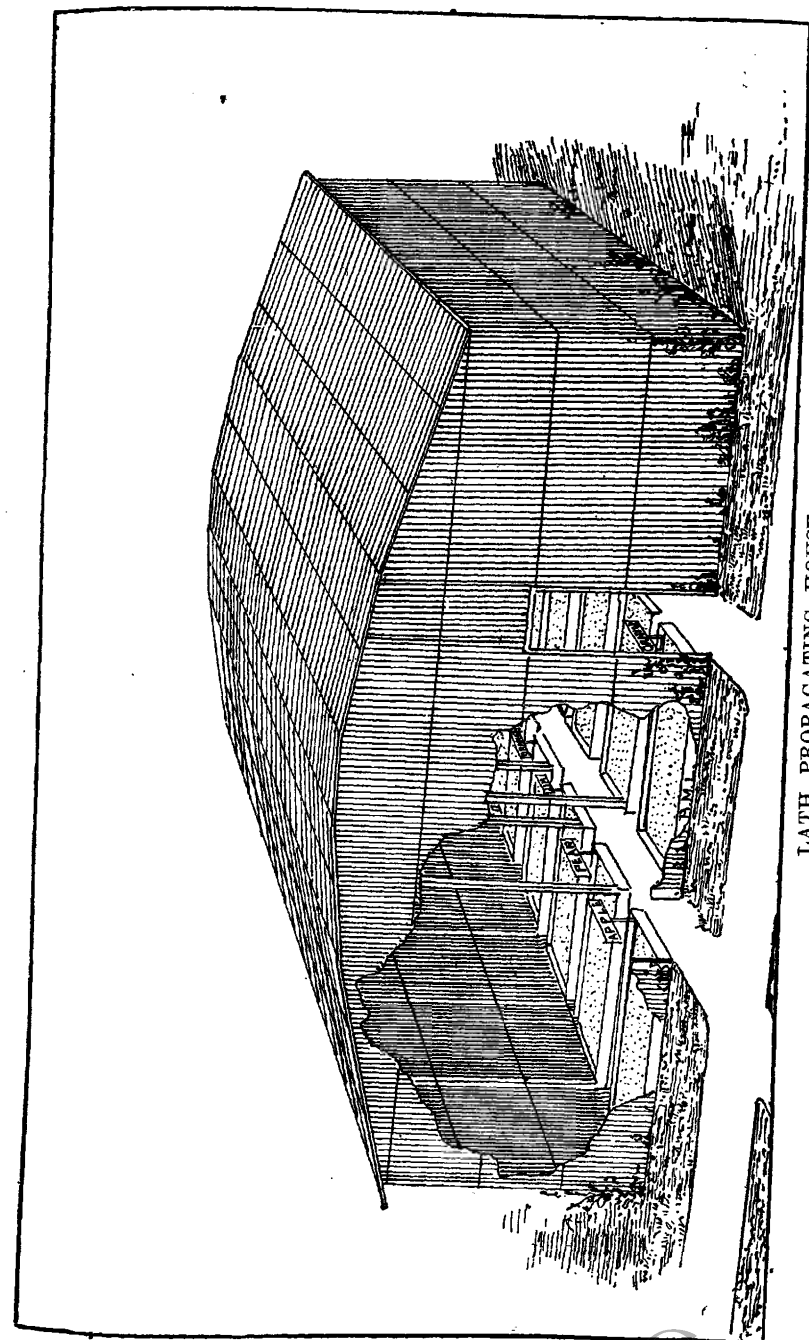
LATH PROPAGATING HOUSE.

For the germination of apple, pear, orange, and other seeds, there is nothing better than a lath house, a good idea of which may be had from the illustration. The laths are one half inch apart, giving the plants enough light and air, and at the same time preventing the ingress of birds, etc., which scratch up the seeds, especially while sprouting. They can be made of any size, and the seed-beds, which consist of frames sunk in the ground, are not only used for the growing of seedlings exclusively, but also for starting cuttings of different kinds.

SAND-BEDS FOR SPROUTING PITS, NUTS, ETC.



The method of preparing sand-beds for sprouting peach, apricot, plum pits, nuts, etc., is shown in the above illustration. The frames are made of twelve-inch boards set on edge, and of any size desired, and rest on the ground. They are partly filled with sand, upon which a deep layer of pits or nuts is placed, and covered with sand. The sand is kept continually moist, yet not too wet, and in case of lack of rains is watered. The seed is examined from time to time, and as soon as it commences to sprout is taken out of these sand or sprouting beds and planted in the nursery.



LATH PROPAGATING HOUSE.

CHAPTER II.

BUDDING.

The process of budding is performed during the growing periods of the various kinds of trees. The peach, cherry, almond, apricot, plum, etc., are budded as soon as the cions, or buds, have developed or matured in the spring or midsummer, and if budded early they can be started the same season, but if budded late they have to be left dormant through the winter. The apple, pear, quince, etc., are budded in the summer, and as they do not grow as rapidly as the peach, almond, etc., they are left to lie dormant till the following spring, when they are started. The



Fig. 1.

A. The point which should not be used, as the buds are generally blind. B. Point from where the buds are developed. C. Beyond this point the buds are too tender, and should not be used. D. Indicates the cion, or budding stick, to be used, being between points B and C. E. The cion, or budding stick, trimmed ready for budding.

orange, lemon, lime, citron, etc., are budded all through the summer, from early spring. The best time, however, is just as the sap begins to rise. The buds at that time "take" more readily, and the growth is undisturbed through the growing period of the tree. The fig, walnut, chestnut, etc., are budded during the summer and the buds left to lie dormant, to be started in the spring. The olive and other evergreen trees of this kind are budded from the time the sap begins to rise in the spring until late in the fall. If budded early they are started and make good growth the same season. If budded late they must be left to lie dormant till the spring following, when they are started.

BUDDING THE PEACH.

The budding of the peach is perhaps the most simple; the buds take more readily, and less care and practice are required than in budding other trees. The first important factor is the selection of cions, or buds. The illustrations (Fig. 1) furnish a good example of the budding sticks and the method of preparing them for budding. The budding sticks or buds having been prepared, they are placed in a box and covered either with wet sacks or moss. In taking them to the field, it is advisable to never allow the sun to strike them. A small, shallow box, with a layer of wet moss at the bottom, on top of which the



Fig. 2.

buds are placed and covered with a wet burlap sack, is much preferred. As the operator proceeds, only one stick is taken out and used at a time.

The operation is performed with a sharp knife, called "budding knife." Fig. 2 represents a favorite style with me, and is called the *Saynor*; there are others that are also very good, such as the I X L, or Wostenholm.

A vertical incision is made in the bark of the young tree by simply pressing the point of the knife against the bark and drawing it up, making a cut from about one quarter to one half of an inch long; then by placing the knife transversely, and with a slight twist of the hand from left to right, the transverse cut is made (Fig. 3). At the same time the edges of the bark become loosened, so as to easily admit the bud; then by pressing the bud it will work its way downward in the slit until it reaches a firm position, and the bark covers it tightly. The buds are then tied firmly with good, soft cotton twine, and left in that position until the time comes for the strings to be cut, or the buds started or left to lie dormant, as will be explained later on.

The cutting of the bud from the stick becomes an important factor. The bud should not contain too much wood, and should not be cut so thin that when tied it is squeezed into nothing. For this reason it is always advisable to use large and plump buds. The stick is held firmly with the left hand and the bud cut with the right, as shown in Fig. 4.



Fig. 3.
A. The stock. B. The transverse cut. C. The vertical incision.

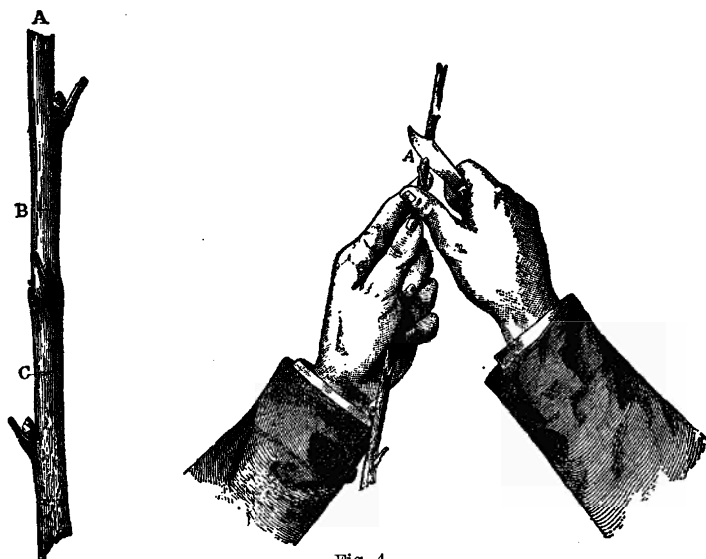


Fig. 4.

A. The cion, or budding stick, showing how the buds are cut, and the position in which the knife is held. B, C. Points indicating the length to cut the buds.

NOTE.—These illustrations show how the buds are cut with the point of the bud upwards, but they may be reversed if the operator so chooses.

The bud is then inserted in the slit or incision, as shown in Fig. 5. The bud is then tied; for this purpose good, soft cotton twine is the best. The work can be done more expeditiously and the results will always be

more satisfactory than when other materials, such as cloth strips, etc., are used. Many tie differently from others. Some prefer to commence the operation by wrapping the twine below the bud first, and wrap until the top is reached. I much prefer to begin the wrapping above the bud and finish at the bottom. It is of great advantage, because the bud will not slip while being tied, and it is kept in position, and instead of allowing it to slip or relax, drives it down further into the slit, and in this way a most perfect fit is obtained. The principal and most important part of the operation lies in tying the buds well, for if they should be tied loosely the air gets between the bud and the inner bark of the stock, causing the sap between them to dry and preventing adhesion.

If the weather is favorable the strings can be cut in fourteen days. In case there should be a continuance of heat it is better to leave them undisturbed for another week, because the heat sometimes causes the bark to open and the buds to dry out.

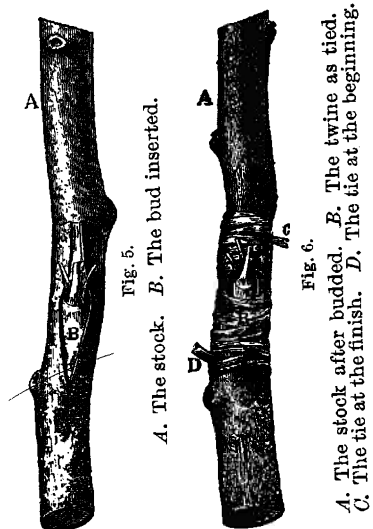


Fig. 5.
A. The stock. B. The bud inserted.

Fig. 6.

A. The stock after budding. B. The twine as tied. C. The tie at the beginning. D. The tie at the finish.

In the summer young peach trees grow very rapidly, and sometimes the strings will cut into the bark, and in this way many buds are lost, therefore they should not be neglected, and the strings should be cut at the proper time. It is always advisable to insert the buds pointing one way—in the direction of the rows—so that in searching for those that miss, in rebudding, or in cutting the strings, a person need not spend time in searching to find them.

STARTING PEACH BUDS.

The most important point after budding is the starting of the buds. When the plants have been budded in early spring (June) they can be started, and the buds, if properly attended to, will become salable trees



Fig. 7.

A. The brush left on the stock to induce the bud to start, by acting as suction—drawing up the sap. B. The stock. C. Point where the bud may be tied to protect it from breaking. D. Point where the old stock is to be cut away, the dotted line below it indicating how much the bud is endangered by cutting lower than this line.

by winter, known and designated as June buds. The starting of a June bud requires care, as the trees are young and full of vigor, and brittle to a certain extent. If the tops of the stocks are cut entirely off, as in

starting buds in the spring, the shock to the stock is too great and will stop the immediate flow of sap, and the tree will die. The best way is to bend the tree over, and by giving it a twist the stock will crack about the center, say about ten or twelve inches above the bud; this will give the stock a slight shock, although so slight as not to disturb the flow of sap, and at the same time induce the bud to start. When the buds start and have made a growth of three to four inches the main stock is cut away about eight inches above the bud, but should not be cleared of all the brush, as the stock may die back and endanger the buds. It is always better to allow a little of the brush to remain, as shown in Fig. 7, at A.

After the bud has made a growth of a foot or more the stocks are cleared of all brush, and the stump may then be cut back, but it is better to leave it until fall.



Fig. 8.

A. The stock trimmed of all growth. B. The point where the bud was inserted. C. The point where the top was cut off to start the bud. D. The bud started.

With buds that are let go and lie dormant, the operation is somewhat different, and does not require the attention given to starting June buds. In February the stocks are cut back about from four to six inches above the bud; then all the brush is cleared away and the nursery cultivated. Nothing then remains to be done but to wait for the buds to start, and with them there will be numerous suckers, or shoots, that have to be

removed from time to time. These are removed by hand-pruning, they being very tender break at the touch. When the buds have made a growth of about a foot or over, they take the entire flow of sap from the stock, and therefore suckering becomes less necessary. The buds may be tied to the stock, so that they may make a straight tree, but this is seldom practiced, and is only done where trees are not grown extensively, as the buds grow remarkably straight in the nursery.

SPRING BUDDING.

In this method the tops of the stocks are not removed, but are left undisturbed, so that when they leaf out the bark may slip easily, otherwise it will become tightened so as to prevent budding at this time. Peach seedlings generally leaf out early, and buds inserted at this time grow and make large trees by fall. As soon as the bark separates from the stock the buds are inserted in the ordinary way. Three weeks after the strings are removed and the tops cut back to force the buds to start, the same as in June budding. The cions or buds are from wood of the previous season's growth, and are gathered early and kept with the larger ends in moderately moist sand in a cool place. This prevents them from starting, and they can be kept until late in the spring.

BUDDING THE ORANGE.

The best time to bud the orange is in March and April, just as soon as the trees begin to show signs of growth. The sap is then rising, and if budded at that time almost every bud will take, and in less than a month will start. It is best not to cut the entire foliage of the stock when starting the buds; a little should be left to keep the sap in the stock flowing, and induce the buds to start. Summer budding is performed in July and August, but the buds do not then start even, and as many start so late the growth by winter is quite tender, and the trees are liable to be nipped by frosts.

The selection of the buds is very important, and only the best should be chosen. When weak and immature buds are inserted they often remain dormant in the stock a year before starting. Buds to be left to lie dormant are put in as late as possible, but before the stocks begin to relax in growth, to prevent them from starting at that season and the bark growing over them.

STAGES OF BUDDING CITRUS TREES.

The different stages of budding the orange, lemon, lime, citron, etc., are as follows:

The selection of proper buds is a very important factor, Fig. 9 illustrating the kinds of cions or buds to select.

First—The vertical incision in the bark, and the position in which the knife is held. (Fig. 10.)

Second—The transverse incision. (Fig. 11.)

Third—The opening of the bark by a slight twist of the hand from left to right. (Fig. 12.)

Fourth—Cutting the bud. Fig. 13 shows position of the hands and

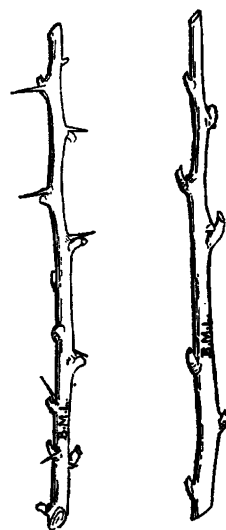


Fig. 9.

Thorny lemon bud. Thornless orange bud.

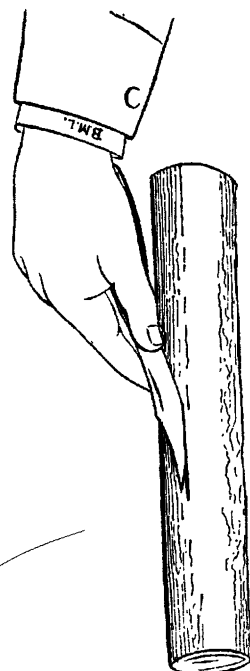


Fig. 10.

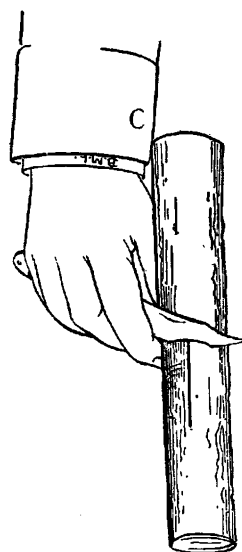


Fig. 11.

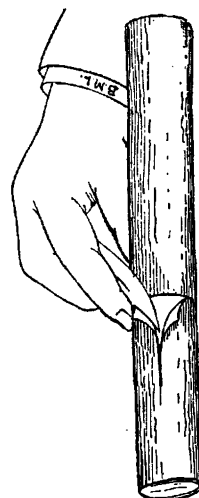


Fig. 12.

knife, and the point of the buds downward. In this way the buds are cut cleaner and much sharper, and do not crack in cutting.

Fifth—Bud inserted. (Fig. 14.)

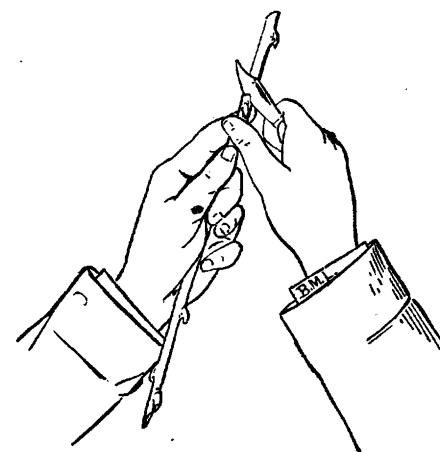


Fig. 13.

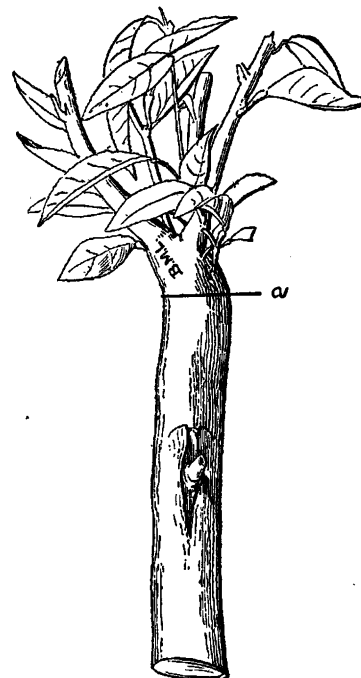


Fig. 14.

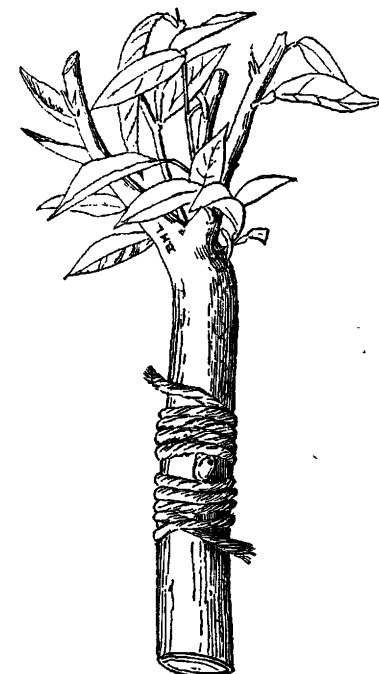


Fig. 15.

Sixth—Bud tied; operation complete. (Fig. 15.)

In these latter figures (Figs. 14 and 15) the method of cutting back the stock to start the bud is shown, and the portion of brush and leaves left remaining, to prevent a check in the flow of sap, which are removed later, when the buds have made a start of two or three inches, at the point shown at *a*.

APPLES.

Budding apple seedlings is not a difficult operation; that is, it does not require so much skill as do other trees. The operation is performed during the growing season, generally in August and September. The incision in the stock is made in the same manner as described for the peach. The buds are cut from a shoot of the current season's growth, about an inch and a quarter long—a half inch above and three quarters below—as shown in Fig. 16, and inserted under the bark of the stock in an incision previously made, as is shown in Fig. 17, and is then tied with cotton twine; for this purpose sixteen-ply is most preferable. In three weeks the twine is removed, and if the bud has "taken," it is left to lie dormant until the spring following, when the stocks are cut back (in March) to force the buds to start. It is very necessary that the stocks be making growth, so that the bark may slip easily, otherwise the buds will not "take" so well. It is also very important that the operation be performed at the proper time; if performed too early, when the stocks are in a thrifty growing state, the formation of new wood will surround and heal over the wound or incision made in the stock, covering many of the buds, and many, instead of remaining dormant, will start, making only short, willowy shoots, which in spring start late, and do not make the best of trees. The stocks should also be budded before they have ceased to grow, because then the bark tightens, and a bud that has to be forced under the bark often fails to "take," and those that fail cannot be again budded that season—the time for successful operation having passed. The growth of the stocks should be watched, and the stocks budded before they have ceased to grow; but by this it must not be inferred that very early budding is preferable, excepting when the buds are to be started, to make what is commonly called June buds. Stocks finishing their growth early in the season are budded early, and stocks that grow until autumn are budded late. The buds must be perfectly developed. Undeveloped buds remain dormant in the stocks and do not start even with the rest, and as they do not start until they have developed, sometimes not until late in summer, they make but very little growth the first season. For early spring budding, the maturity of the buds is hastened by pinching the tips of the shoots of the trees from which they are to be gathered, the buds being taken from the trees just before they start the second time. In this way a soft shoot is made to harden, and its buds are fit for early budding in ten or twelve days. If a considerable quantity are wanted, they are stripped of their leaves and packed in moss or wrapped in dampened sacking immediately after being cut, and put away for future use. They can thus be kept for two or three weeks.



Fig. 16.
The bud as cut
from the limb.



Fig. 17.

Bud inserted.

BUDDING.

ALMOND, APRICOT, CHERRY.

Almond.—See method of budding the peach; it is the same for the almond.

Apricot.—See peach—the same for apricot.

Cherry.—The method pursued in budding the cherry is very similar to the method employed on the peach. Mazzard seedlings, for standards, are budded in July and August, and left to lie dormant through the winter, to be started in the spring following. Morello and Mahaleb seedlings, for dwarfs, are best budded in August. They are somewhat more difficult to make "take" than the Mazzard, and the operation is best performed when the stocks just begin to relax in growth.

CHESTNUT.

The chestnut is very successfully budded in the summer during the growing period of the stock. The following illustrations show the size the bud is cut, the cut in the stock, and the bud as inserted and tied:

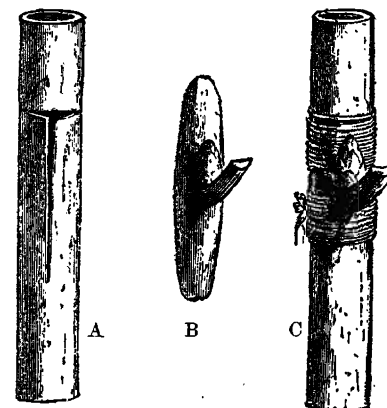


Fig. 18.

A. The stock showing the incision made to receive the bud. B. The bud, showing the size of same, and manner in which it is cut. C. Bud inserted, showing method of ligature.

The slit or incision in the stock is made first, then the bud is cut from the budding stick and immediately inserted into the slit or incision in the stock, and tied tightly with soft cotton twine. In three weeks the strings may be removed and the buds left to lie dormant until spring, when the tops of the stocks are cut back in March to force the buds to start. The operation is best performed in August, when the stocks are making growth, and better still when they are just hardening the growth in the latter part of August. The chestnut is also budded successfully by the ring method, as described for the fig.

CITRON.

See method of budding the orange; it applies to the citron also.

FIG.

The fig is perhaps the most difficult tree to bud. The milky substance that exudes from the limb or bark seems to sour and poison the sap when it comes up from the stock, and prevents the bud for uniting, and for this reason the methods of budding as employed on the peach, pear, etc., cannot be used on the fig. For the fig the best method is to cut a

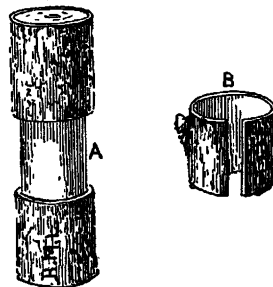


Fig. 19.

A. The stock prepared. B. The bud.

ring right around the stock, as shown in the figure at A, say from three fourths of an inch to an inch long. Then another ring of bark is taken from a limb (the cion), of the same size, having the bud wanted, as shown in the figure at B; this is then slipped into the cut in the stock, and bound tightly with the soft cotton twine or cloth, covering it up to exclude the air. By this method the ascending sap will unite with the sap of the bud. The operation should be performed in August or September.

LEMON AND LIME.

Lemon.—See method for budding the orange; it is the same for the lemon.

Lime.—See method for budding the orange; it applies to the lime also.

OLIVE.

Budding the olive by the ordinary methods is somewhat difficult. The methods herein given are the most simple and the most practiced. The plate bud is the one most largely used. This is one of the most simple of all methods of budding the olive, and can be operated on small and large trees. A cut is made on the stock, thus [], and the flap drawn down. The bud is then cut from the cion to be a little smaller than the space cut in the stock; it is then inserted, as shown in Fig. 21. The bud consists of only the bark and an eye. At every leaf there is a bud, and the bark being cut around it, separates very easily from the wood. The flap is then turned up, covering the bud entirely, and is tied tightly with good, soft cotton twine. In three weeks or a month the strings must be removed, and girdling the tree about an inch or two above the bud will induce the bud to start. After it has commenced to grow well the top of the tree may be cut away a foot above the bud, and the bud trained to the stock.

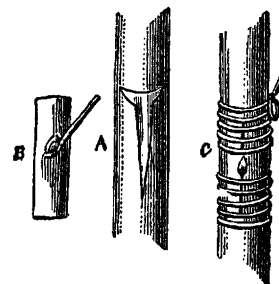


Fig. 20.



Fig. 21.



Fig. 22.

Fig. 20. A. Incision (ordinary budding) in the stock. B. Plate bud. C. Bud inserted and tied.

Fig. 21. Plate bud inserted; front view, showing flap, which is turned upwards and then tied.

Fig. 22. Bud inserted and covered with the two flaps from above and below, and is known as the "H" method.

Another very simple operation consists in making a cut in the stock in the form of an H; the flap is then drawn both ways, up and down, from the center cut, and the bud inserted, the flaps protecting both ends of the bud, as shown in Fig. 22. This method has the advantage that large buds, having a large bulge at the leaf part, can be used, while they cannot in the single-flap method. The other figures (Fig. 20) show how the buds are removed and inserted by the ordinary plate method.

The twig bud is also very simple, but requires more skill and care.



Fig. 23.



Fig. 24.

Fig. 23. Twig bud, showing how it is trimmed and removed from the branch.

Fig. 24. A smaller twig bud, showing how the wood in the bud is gouged out.

By this method the cut is made deep into the wood to give the bud sufficient bark, as most of the wood in it is afterwards removed. The leaves are partly cut off, leaving at least a half inch of the leaf on the bud to prevent the bud from drying; then, with the sharp point of the budding knife, the greater part of the wood inside of the bud is removed,

as shown in Fig. 24. If part of the wood is not removed then the bud cannot take, as the wood in it prevents it from uniting. The bud is then inserted into the stock, as in the ordinary way, and tied tightly. In three weeks the string is removed, and part of the top of the stock is cut back to force the bud to start. As the bud grows the foliage of the stock is gradually removed, until the bud is able to take up the entire flow of sap; it is then left to grow. This process is performed at any time of the year when the sap flows freely. Best results are, however, obtained when the buds are inserted early in the spring of the year, as the operation can be performed to a much better advantage, and the buds will grow to some height before the winter months set in.



Fig. 25.
The bud severed
from the stick.

PEAR.

The pear is budded in the same way as the apple, and the operation is performed in like manner, excepting that the buds are cut sharper and not so long. Pear seedlings may be budded in July or August. The cions are taken from the trees of the current year's wood, the leaves trimmed off, and the bud inserted in the same way as the apple. Fig. 25 shows how the buds are trimmed of their leaves, and the size cut from the limb. The buds are cut all the way from three fourths to one and one fourth inches long. Point *a* (Fig. 26) shows the length cut above the bud, and point *b* the length below it.

PLUM.

The plum is budded during the months of July and August, and in some localities the stocks begin to relax their growth quite early; they should, therefore, be watched and budded before the bark tightens. The method for the plum is like that for the pear, and is performed in a like manner. Fig. 27 represents how the bud is cut from the stick, and the length. Many prefer to remove the wood in the bud, as they take better, but this is not necessary when the knife used is quite sharp and properly tied. For time of cutting back, starting the buds, etc., see pear, peach, etc.

QUINCE.

The system as explained for budding the pear will suffice for the quince.

WALNUT.

The walnut is budded very successfully by the following method: The bud is cut, as shown in Fig. 28, about one and one half inches long. The cut is made deep into the wood, the object being to give the bud as much bark as possible. The wood of the bud is then partly removed; it is gouged out with the sharp point of the budding knife, as too much wood in the bud prevents a proper union. The bud is then inserted

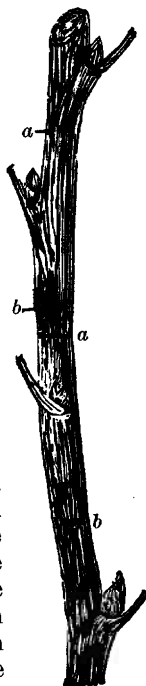


Fig. 26.
Budding stick,
showing the size
buds are cut.

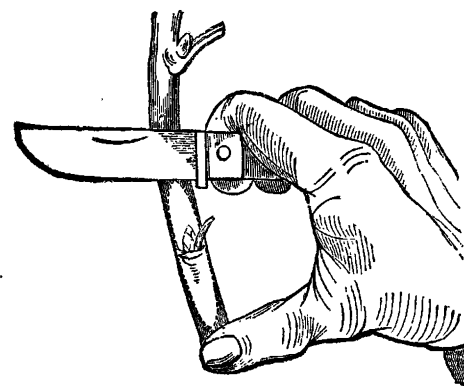


Fig. 27.



Fig. 28.



Fig. 29.

Fig. 28. Size of bud and how cut.
Fig. 29. Transverse view of the bud, showing how the wood, and how much of it, is gouged out.

into the incision made in the stock, the same as ordinary budding is done. The bud must then be tied tightly with heavy budding twine. In three weeks after the bud has been inserted the twine may be removed, and the bud allowed to lie dormant until spring. The walnut does not put forth until late in the spring, therefore the stocks are not cut back till then. As soon as the buds of the stocks begin to swell, the stocks are cut back and the inserted buds allowed to grow. Great care must be exercised not to cut the stock so close to the bud as to endanger it. The buds are allowed to grow at will until they become hardy, then they are trained to the stock, the object in view being a straight tree. The operation is performed in July and August, when the tree is making its growth.

CHAPTER III. GRAFTING.

The objects of grafting are the same as budding, but the operation is performed at a season when the stocks have ceased to grow and have become dormant. There must always be taken into consideration the fact of the cion and the stock being of close alliance.

There are a great many grafting methods in use, but the most easily performed and the most generally practiced in this State are the cleft and the whip graft.

The cions (shoots of the previous year's growth) are cut in early winter or at any time after the fall of the leaves, and preserved by burying the lower ends in earth in a cool place, and are thus kept perfectly dormant for future use. It is very important that they be kept in a moderately moist earth or sand, not too wet, as they will rot. In the selection of cions the most important point to be observed is the selection of proper wood, that it be well ripened, from healthy, vigorous trees.

GRAFTING TOOLS.

Knives.—For grafting trees in nursery the only tools necessary are a grafting knife, a knife for facing the cions, and a waxing pot and brush. It is best to have two knives, because if only one is used it becomes dulled in use on the stock and unfit for facing the cions properly. For this purpose I prefer a common pruning knife, as shown in the figure, which should always be kept well sharpened. These are found on sale

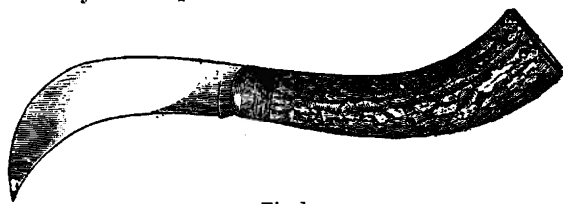


Fig. 1.

with different kinds of handles. I much prefer the *buck* handle, as it is rough and never slips from the hand while using. The knife for facing or preparing the grafts should always be kept sharp, and if it is only used for facing it does not require whetting often. For facing, the budding knife called I X L, made by George Wostenholm, Sheffield, and having a stout, black handle, has always given the best satisfaction, and is preferable for this purpose. If the stocks are small the facing and splitting are best and most expeditiously done with the latter knife.

Saws.—It is always best to have sharp tools with which to cut those stocks which are too large to be cut off with a knife. Cutting them with shears should be avoided; instead, they should be sawed off with a fine-

toothed saw. This is especially required on stocks too large to be whip grafted. Fig. 2 represents a common bow saw—a home invention—yet it gives the best satisfaction. In this the handle fits closer in the hand than many others of this class. Both ends of the blade are fastened by means of a little screw onto a bolt, having the other end riveted into a counter-sunk hole, the upper one with a thumb-screw nut, also revolving in a counter-sunk hole. The blade can thus be turned at any angle, or it may be kept in one position by tightening the thumb-screw at the end near the handle. Two small pieces of wood are riveted on either side of the bow at the lower end, which serves as a handle, to prevent injury to the hand. The bow is made of steel, and springs a little. These saws can be made by any one, and, for cutting large limbs, have no equal, as the blade being thin and narrow, and the teeth set wide, will cut through a limb with great rapidity without sticking or getting pinched in the cut, a difficulty met with in all other saws. The blade may be reversed, if one chooses, and made to cut by drawing it instead of shoving; in this way they are not so easily broken.

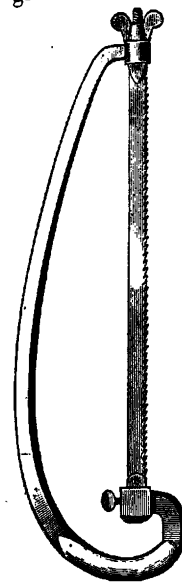


Fig. 2.

Fig. 3 is another home pattern, this one having a handle about sixteen inches long, and the blade guided by it. In using it the handle and bow are grasped together by the hand, which sometimes is very awkward, especially when large limbs or a considerable number have to be cut. In any case it is more tiresome to the hand than that shown in Fig. 2.

A saw called the "California Pruning Saw," constructed on the same principle as Fig. 3, is also a desirable one. The blade is fastened by pegs at each end, which drop into slots, and the blade is tightened by the turn of the handle. The only advantage it has over the others is that the blade can be changed in position without having to remove screws, etc., but this is of very little consequence.

A very good saw is made by simply taking a branch of a tree, such as orange, locust, or any hard wood, in which a hole is bored through at each end; this must then be bent into a bow, the bolt at either end of the blade passed through, and the nut screwed on. In this way all that is required is the blade and the bolt fastenings.

Chisel and Mallet.—For grafting large stocks a chisel and mallet like Figs. 4 and 5 are required. The chisel can be made by any blacksmith from an old file. The point or hook at the end is used to keep open the split for the insertion of the graft. The mallet is used to tap the chisel in splitting stocks. These are made from any kind of hard timber; a piece of locust wood answers the purpose very well. A block, either round or otherwise, is bored in the center, and a handle driven into it, and at the other end (which passes



Fig. 3.

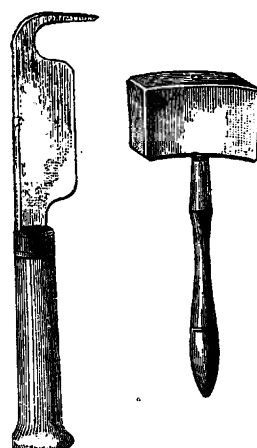


Fig. 4.

Fig. 5.

through) a peg of wood is driven, to prevent the handle from becoming loose. Mallets found in stores do not, as a rule, give as good satisfaction as one of these home-made contrivances.

OPERATORS REQUIRED.

In grafting a considerable number of stocks in the nursery it is best to have three men perform the work, as follows: A to cut the stems off and make the incision in the stock; B to follow A, and insert the cions; C to follow B, and wax the grafts. And still better, if another man is added, to face the grafts and supply B with them, so that B may keep close pace with A in inserting the cions into the stocks as soon as cut; C follows B closely and waxes the grafts, using for this purpose waxed paper. The paper is first waxed, and then cut into strips. He carefully wraps a strip of this paper around the graft, and by pressing all loose points the waxed side adheres perfectly.

WAXING POT.

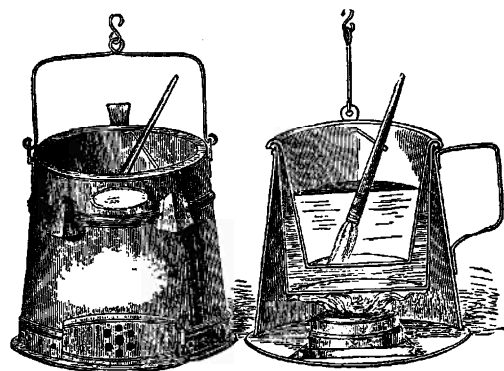


Fig. 6.

Where waxed paper is not used, grafting wax is prepared, and the grafts waxed with a brush. For this purpose a grafting wax pot must

be used. The one shown in Fig. 6 answers the purpose quite well, and is perhaps the most convenient to use.

The wax is first prepared in another utensil, and when cool is broken up into pieces; these can be carried to the field in a box or sack, and kept to supply the pot whenever required. The pot consists of what is called a "glue pot," and can be found on sale in most all hardware stores. Water is first placed in the pot, and then the can containing the wax is let down into the water, and the lamp, which has been previously filled with coal oil, below lighted, and in this way the wax never gets too hot to apply, neither is there any danger of it burning by the pot getting overheated, as it does when the flame plays directly upon the receptacle containing the wax.

GRAFTING WAX.

There are various formulas for making the wax, but the most common in use consists of rosin, tallow, and beeswax, in the following proportions:

Wax.....	1 pound.
Tallow (mutton or beef).....	$\frac{1}{2}$ pound.
Rosin.....	1 pound.
Turpentine.....	2 ounces.

Prepared as follows: Melt the rosin and tallow over a gentle fire, then add the wax, and when well dissolved set aside and add the turpentine; keep stirring until the turpentine has incorporated, and it is then ready for use, or may be set aside for future use.

Liquid grafting wax is made by melting one pound of rosin over a gentle fire and stirring in one ounce of beef tallow. Take from the fire, and when it has partially cooled mix in eight ounces of alcohol. If this cools it off too rapidly it must again be placed over the fire, but great care must be used to keep the alcohol from taking fire. When well incorporated and cool, put in tin cases or glass bottles. It should be kept well covered or corked. In using, a lump about the size of a hen's egg is worked with the hand, and a coating placed around the graft and smoothed over with the hand; the mixture hardens soon after.

WHIP GRAFTING.

This is one of the most simple of the divers methods of grafting young stocks, and is operated either in the field or indoors—on the bench. In grafting seedling stocks (one and two years) in the field, the stems of the stocks are cut off at the collar. The stems are cut by simply drawing the knife upwards, making a smooth, even, sloping cut, an inch or so long; then, reversing the knife, about a quarter of an inch from the center of this cut (towards the end) a slit or tongue is made downwards. The cion is then prepared (which should always contain three or four buds) in a like manner as the stocks. At the lower end of the cion a sloping cut is made downwards, and by reversing the knife a slit or tongue is made in it upwards, which should correspond with that in the stock, into which it is then inserted.

The bark of the cion and the bark of the stock must be placed in close contact on one side; the other is immaterial, as it soon heals over. The union of the two, cion and stock, should be complete and fit firmly. The grafts are then either waxed over or wrapped with waxed paper.

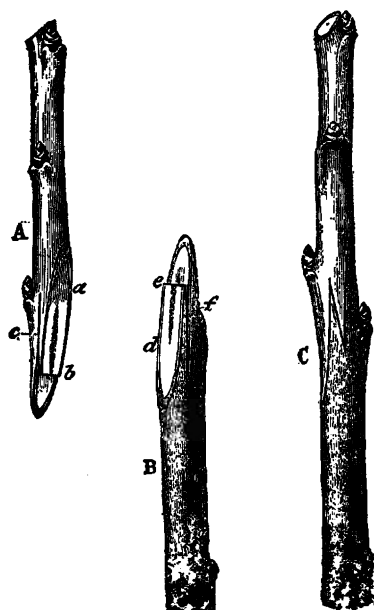


Fig. 7.

A. The cion. a. The sloping cut. b. The tongue. c. Shows thickness of tongue.
 B. The stock. d. The sloping cut in the stock. e. The tongue. f. Shows thickness of stock from the cut or tongue.
 C. The cion inserted, and ready for waxing.

This completes the operation. The earth may then be banked on either side with a hoe, and nothing more is done until they begin to start, when they require attention, especially in keeping them clear of weeds and all undesirable growth, suckers, etc.

ROOT GRAFTING.

For root grafting, the seedlings of one or two years' growth are taken up and the best roots cut into pieces about four inches long. These are taken indoors, washed free from all dirt, and grafted as follows: The operation is performed in the same manner as on the seedlings out of doors, as previously described. The oblique or sloping cut, or tongue, is made in the root; and the cion, which should be three or four inches long, is likewise prepared and inserted, as shown in Fig. 8.

It is then waxed over, either with wax or waxed paper; the latter, however, is much more preferred. The grafts are then put away in sand until planting time, in February, in the following manner: On the floor of a propagating house or shed sand is spread out from six inches to a foot deep, then the grafts are put into it standing, thickly, and covered with sand. The entire graft, to within an inch or two of the top, may be covered, without injury to it. They should, however, not be kept too wet, as the bark of the grafts is liable to decay; and again, they must not be allowed to get dry, as the bark of the graft will shrivel, and adhesion is avoided. During the time they are thus stored

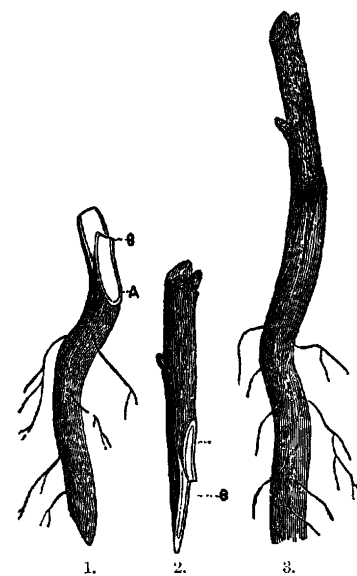


Fig. 8.

1. The root, showing sloping cut at A, and the tongue at B. 2. The cion, showing sloping cut at A, and the tongue at B. 3. The union of cion and stock ready for waxing.

away the parts united (cion and stock) callous over, and soon after planting begin to grow.

CLEFT GRAFTING.

This method is mostly practiced on stocks too large to be whip grafted, although it is also operated on young trees successfully. The stock is first prepared by being cut squarely off, as shown in Fig. 10 at g; a sloping cut is then made in the stock at f, and the top shaved smoothly at g, so that the point of union between the bark and the wood may be plainly seen. The blade of the knife is then driven into the stock, as shown in Fig. 9, to split it as represented. It is always best to prevent the stock from cracking or splitting clear through. This is avoided by using the knife properly. The point of the knife is driven in, as shown in Fig. 9 at C, and the blade driven in at B, and instead of forcing the knife down further to produce the split, it is drawn upwards and towards you, and a perfect cut without cracking through is made, as shown in Fig. 10 at h. The cion (Fig. 10, A) is cut precisely in the form of a wedge, with the part cut for insertion in the stock about an inch or an inch and a half long. It should always have a bud at the shoulder where it is to rest on the stock, and the outer edge thicker than the inner, and inserted so that the point of union between the bark and wood on both the stock and cion will exactly coincide, as shown in Fig. 10 at C.

On larger stocks the stem is sawed squarely off, and the surface dressed or shaved off with the knife. The knife is then driven into the stock, as shown in Fig. 11, and should be to one side of the pith. The split is kept open with the knife until the cion is inserted. It is always

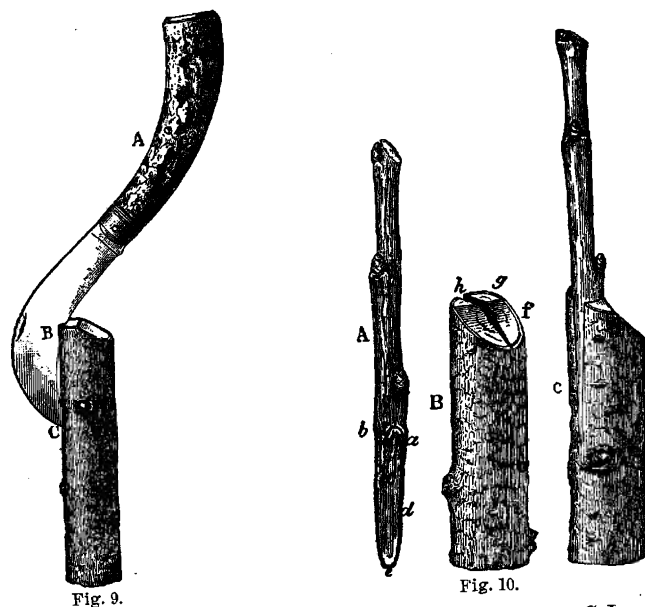


Fig. 9.

Fig. 10.

Fig. 9. A. The knife as used in splitting. B. The point of the split. C. Length to split; the position (shown at B and C) shows how cracking of the stocks is avoided.
 Fig. 10. A. The cion, showing how it is prepared—wedge-shaped—with a sloping cut. B. The stock prepared to receive the graft; f. The sloping cut; g. The horizontal cut; h. The split. C. The cion inserted in the stock, showing the close fit of both, and ready for waxing.

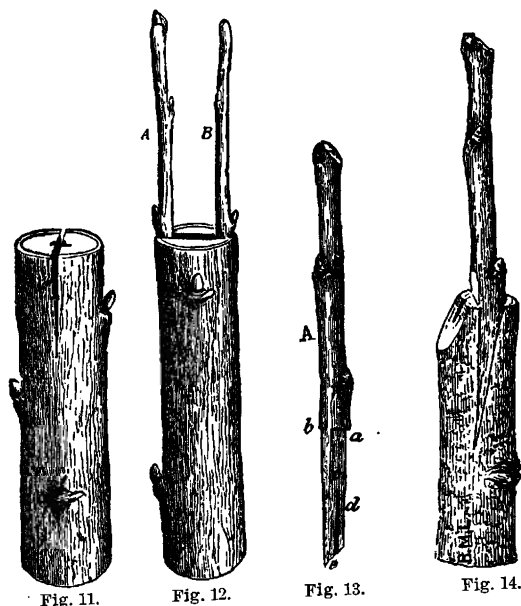


Fig. 11.

Fig. 12.

Fig. 13.

Fig. 14.

Fig. 11. The stock split, ready to receive the cions.
 Fig. 12. A, B. The cions inserted, ready for waxing.
 Fig. 13. A. The cion; a, b. The horizontal cut severing the chip on either side; c. The wedge; d. Pith; e. Point of cion cut obliquely.
 Fig. 14. Graft inserted in stock obliquely.

best not to split too deeply, to allow the graft to work its way down a little and be held firmly, otherwise the graft will loosen and will not adhere. Then again, the operator must see that the stocks do not close so firmly on the cions as to crush the ends. To avoid this a small wedge is driven into the split on the opposite side. This, however, is seldom required where two grafts are inserted, as shown in Fig. 12. In most instances both cions grow, and as they are too close together, one is afterwards removed. There is more than one way to shape or face the cion, but the point in question should be the most expeditious one, and it has always proved that when the work is done rapidly the grafts take better, not because it requires carelessness (which should not be inferred), but because the sooner the graft is in position in the stock with less handling or whittling, the better. Where time is no object the following is a very good method of preparing cions:

The end of the cion is first cut (obliquely), then a cut is made at *a* and *b*, but deeper at *a*; then a shaving is taken off by drawing the knife from the end towards *a* and *b*. This cion differs from the one previously described only in the method of preparation. It is inserted in a like manner. The method of inserting the cion, and the splitting of the stocks, is not confined to those described, and growers generally find a way by which the method operated with can, in some way or other, be improved. For instance, where the splitting is done obliquely instead of parallel, the grafts take better. This is especially so in grafting prunes. The barks of the cion and stock come obliquely together, and the cion is held firmly in place.

GRAFTING UNDER THE BARK.

This is a very simple operation, and is performed just as the sap begins to rise in the stocks. Young peach, plum, and pear seedlings put forth quite early, and are grafted at any time after the leaves begin to grow, by the following method:

The stocks are sawed off, and with the knife a vertical incision is made on one side of the stock, the same as for a bud. The graft is then prepared, by simply facing on one side, as shown in Fig. 15 at *c*. It is then inserted in the slit, in the manner that buds are inserted, and is then tied and waxed over. For tying, waxed cloth is greatly preferred, as it serves both purposes—that of tying and waxing—in one operation.

GRAFTING THE FIG.

The fig can be grafted after the ordinary cleft graft, but budding by the method described under the head of budding is more easily performed and surer to take.

A. W. Cass, of San Diego, reports having been very successful in grafting the fig in the month of February, as follows:

"I saw off the stock; split it through the center. If the stock is two to four inches in diameter, I put in two grafts—one next to each side or bark. I cut the wedge-like taper about four inches long and have one or two buds only. The cions should be one half inch or less in diameter. When the grafts are both forced into the split there will be considerable space unoccupied. I fill the space with *hot* grafting wax—

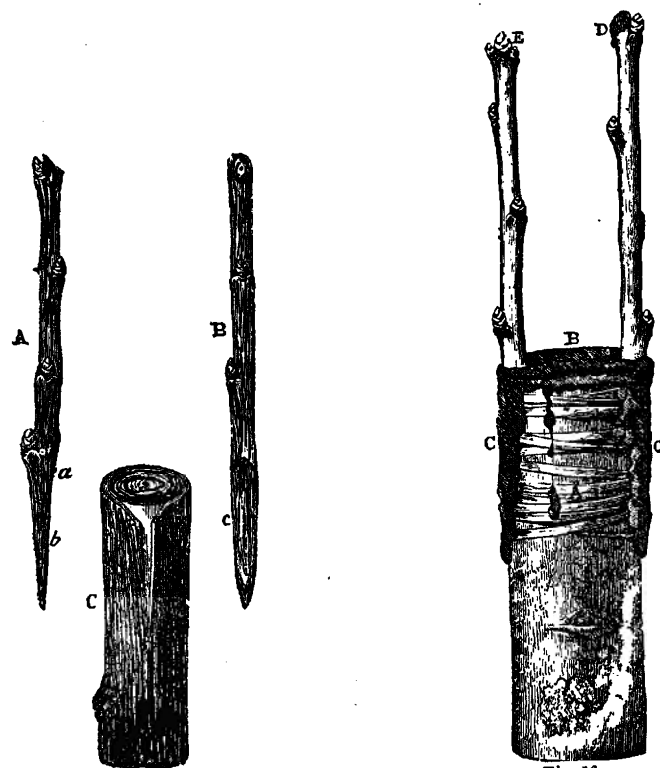


Fig. 15.

Fig. 16.

Fig. 15. A. The cion, side view, showing thickness of cut at points a and b. B. Cion, transverse view, showing how faced at c. C. The stock, showing how it is cut off and the incision made to receive the graft.

Fig. 16. OPERATION COMPLETE.—Stock grafted with two cions, and applicable to stocks with one cion. A. Twine, showing how it is tied. B. Waxing top surface. C. Waxing on the side, covering graft. D. Graft waxed at the end. E. Terminal bud, waxing at end not required.

that is, I heat my wax so hot as to *flow very readily*. I then with a paddle cover the end of limb around the grafts, also the ends of grafts, also the edges of graft and limb, after which I take a strip of muslin one inch wide and three or four feet long (must be strong), and wrap the limb and graft, commencing an inch or two below the lowest extremity of the split, wrapping and drawing the muslin very tight, at the same time waxing each turn of the cloth with the hot wax, using the paddle. When wrapped to the top of the stub, wrap the muslin between and around each cion, waxing carefully and thoroughly. The whole secret is to keep the air excluded from the cut. Fig bark shrinks very quickly—so quick, and so much, that the graft has not time to take before the bark is drawn away from it and the sap channels are dry. The *hot wax* is the only perfect way to protect it from the air, and the close and tight wrapping is to prevent shrinking of the bark. In other respects the rules of any other grafting hold good."

GRAFTING THE WALNUT.

The walnut is quite difficult to graft, on account of the large amount of pith the shoots contain. Young trees—a year old—are quite successfully grafted by the triangular crown method. The stocks are not split, but instead a triangular incision is made in the side of the stock, as shown in

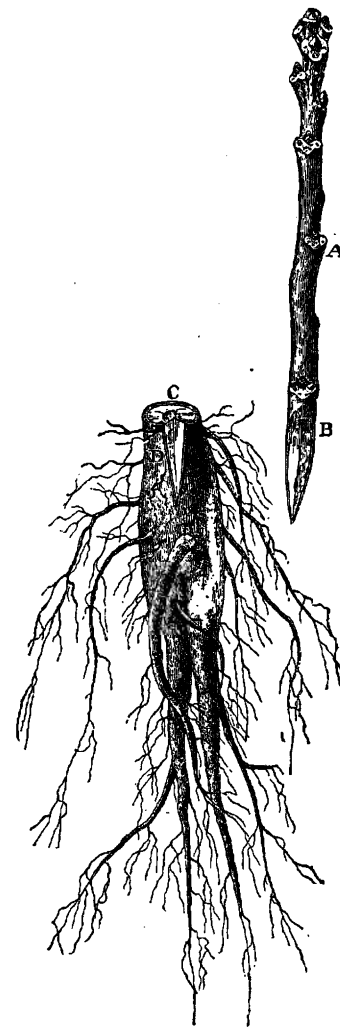


Fig. 17.

Fig. 17 at C, about one to one and one half inches long. At this point the wood of the stock is generally quite solid, and the pith very small. This cut rather consists of taking out a triangular piece from the stock, into which space a cion is inserted of the same size. D shows the space; A the cion to insert. The cion is prepared to fit the corresponding space, from terminal shoots, as shown at A, and faced, as shown at B, and fitted into the cleft. It is then tied with cloth and waxed over. The soil is then banked up against it, covering the graft and stock to

within an inch or two of the top of the cion. In tying it is best to use cloth, and to only wax the parts cut or exposed, so that in a short time the parts not waxed may decay, and prevent the cloth from cutting into the stock. For making the cleft and facing the cion it is important that the knife be quite sharp. This operation is best performed, and most successfully, when the stocks begin to show signs of growth late in the spring. The cions are cut late in the fall, or early spring, and kept in sand preparatory to using.

GRAFTING THE OLIVE.

The olive is most successfully grafted during the months of March and April, but preference is given to those grafted in March, by the following deft method:

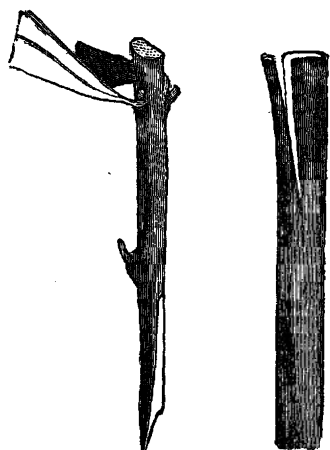


Fig. 18. Cion.

Fig. 19. Stock.

In this method the stocks are not split down the center as in the old way, but instead, the cut is made obliquely, so that the barks of the stock and cion may come obliquely together, and in which way the grafts make a surer and better union. The graft is faced on both sides, to be large at the surface side and thin at the inner, exactly in the shape of a wedge. The graft is driven down as far as it will go, and made to fit exactly, the barks of the cion and stock to be even on the surface side; the other side does not matter, as the cion unites with the stock at first only on the surface side, and in time both sides heal over. The graft having been inserted, it must be tied and waxed. For tying, cloth or twine may be used, and the wax applied over it. In grafting nursery trees in the field it is best to graft them low, the grafts to be covered with earth to within an inch or so from the top, leaving as little of the graft exposed as possible. This is a protection to both the cion and stock, especially from scorching heat, which causes grafts and stocks to die back when left exposed. The leaves of the grafts should never be broken off, but cut, nor must they be cut entirely off; at least one third of the leaf should be left (as shown in the figure) to prevent the graft from drying before it has had time to unite with the stock. Neither must the entire leaf be allowed to remain on the graft. The trimming of the leaf prevents it from carrying off too rapidly the fluids of evaporation.

PART V.

INSECTS INJURIOUS AND BENEFICIAL, WITH TREE DISEASES AND THEIR REMEDIES.

CHAPTER I.

INSECT PESTS AND TREE DISEASES.

Almost every steamer that arrives at the port of San Francisco from foreign countries brings consignments of trees, plants, etc., and so far none have been found free from injurious insect pests. These consignments have been promptly placed in quarantine and disinfected, as provided for by the law and the regulations of the Board. There have also been large shipments of trees into this State from Florida, and in almost every shipment infected trees were found. It has often been asserted that the insects with which they are infected would not live in this State, but these theories have only proved fallacies. The same theory has been advanced with regard to other pests not yet on this coast, such as the plum curculio, etc.

Several years ago these same theories were advanced, when the late Matthew Cooke tried to make the people aware of the disastrous results that would follow if the codlin moth were allowed to spread. Our climate is mild, and therefore wonderfully favorable to the propagation and dissemination of all tree and fruit pests. Recently we have read with much amusement the many theories advanced with regard to the "yellows" and the "rosette" not thriving in this State. But in most every case the theorists are interested in the sale of cheap Eastern trees, and, of course, must give some theory or excuse through which they can dispose of their nursery stock. Recently several nurserymen have arrived trying to sell Eastern trees; one of these, in a letter addressed to me under date of November 4, 1891, said:

Fate seems to be against me. I arrived here (Fresno) last night. Have only seen one nurseryman here, and he says that the feeling here is so strong against buying Eastern peach trees—but he, like ——— and every other nurseryman I have met in California, says he thinks there is *no danger* of introducing the yellows into California by bringing in Eastern trees; that if it could be done you would have had it long ago from trees that have been brought in. In my opinion, it is ridiculously absurd; you had just as well say that you would allow no horses to come from the East for fear of introducing the heaves into California, which many of our horses have and yours do not. I am *so sure* there would be no danger that I would be willing to deposit with the State Board of Horticulture 25 per cent of all the money I get for my trees for five years, all of which I would forfeit in case the yellows developed from trees sold by me; but if it did not develop in that time, the money, with 7 per cent interest, to be paid to me. I wish you would write me fully, and at once, what you think of this proposition, and whether you could get the State Board together promptly and see if they would agree to this proposition. If I can't know very soon it will do me *no good*, as our packing season closes usually by the twenty-fifth of this month, and we can't pack four hundred thousand trees in a day or two.

It is well to be cautious, but this scare deters planters from planting trees, thus depriving them and the State of millions of dollars they might have. Dried fruit (peaches) will certainly advance. I think it is cornered now by speculators. I don't think there were over *twenty tons* of peaches dried in our peninsula this year.

This letter comes from a gentleman of very high standing, and my only regrets are that he should be in that business, and I have no doubt but that his intentions are well meant. The letter also contains valuable information. Delaware was once the most productive peach region of the continent. The yellows has laid almost everything bare, and,

according to his own statement, the entire dried product was less than twenty tons. He says he would be willing to deposit 25 per cent of all sales for five years for the privilege of selling his trees, and according to his letter he has four hundred thousand trees to dispose of this season. If that amount would be allowed to be brought into the State, in five years he would have disposed of two million trees. Certainly he could well afford to give 25 per cent of all his sales for the privilege of disposing of them. On the other hand, suppose the yellows developed, what recompense would his 25 per cent of all the sales be? Neither could the damage be roughly estimated. At the rate Eastern trees are selling, *i. e.*, \$75 per thousand, landed, two million trees would be worth \$150,000. Thus any business man can readily see that to sell \$150,000 worth of goods 25 per cent would be but a small margin when compared with the profits, and would simply be making the State the agent for the sale of Eastern trees. Any nurseryman would be but too glad of the opportunity of allowing 25 per cent off \$150,000 worth of sales, whether from the East or other localities.

The cottony cushion scale played great havoc with the citrus industry of this State in late years, by its introduction on a few trees, and the damage done to one section alone amounted to more than the total sales of citrus trees for twenty years. However, that trouble is over now, and the orange and lemon groves have been again restored to their former healthy condition by that wonderful little insect, the *Vedalia*, which might well be called a miracle. Should the "yellows" appear such results cannot be expected, from the fact that no one has yet discovered the cause, or effected a cure in a single instance.

We appeal to all who have an interest in fruit growing in California to guard against the introduction of this disease, or else the profit and glory of peach culture in our State will forever depart. Once the disease is among us, nothing can ever stop its destructive course, and the beautiful valleys now devoted to peach culture will be laid bare, like those sections in some of the States where the disease has appeared, the old stumps only remaining to tell where productive orchards once stood. It is to be hoped that those times may not come; but this is the time for active work, and we should not wait until the disease is among us before effective precautionary measures are adopted.

The following letter contains solid sense:

TULARE, November 8, 1891.

DEAR SIR: Considering myself on guard against "the yellows," I inclose a clipping from the Bakersfield "Californian" of yesterday. With all due respect to "a prominent horticulturist," I know of soil in Michigan, far above the average, where "the yellows" has flourished to its usual exterminating extent. I have long since learned "better to be safe than sorry," and why take a *single chance* toward introducing "the yellows" in this State? "God and humanity forbid," say I. My superficial mind can only imagine all evil and no good in it; as however careful the party may aim to be, how apt carelessness and neglect are liable to creep in; and then, of course, "very sorry," but that will not mend the error. Excuse the disgust and fear I herein express, for I feel it truly.

Hoping you can yet "nip in the bud" said "prominent horticulturist's" intent, I am,
Very truly yours,

[From Bakersfield "Californian" of November 7, 1891.]

In speaking of the yellows, that disease which has ruined the peach orchards of Maryland, Delaware, and very many other localities in the East, a prominent horticulturist here says he believes that disease cannot take root here. He gives two reasons: the first, that it is a disease which so far has only appeared in impoverished soils; the second, that a humid atmosphere is a necessity. From both of these we are free.

At any rate, he is so convinced of the correctness of his reasonings that he intends to bud some trees here in California from trees known to be infected in the East. Of course he will take all proper precautions to have his experimental trees isolated and thoroughly quarantined against all orchards.

The idea is a good one, for it will determine what we may have to guard against by the most rigid restrictions, or it may, on the other hand, prove that we need fear no danger. It has not yet been absolutely settled that fruit pests are like contagious diseases, and can be carried to places foreign to them and there flourish as they do amid home surroundings.

It has not yet been shown that the disease will disappear from where it has been carried, nor has it been shown that it can be transferred to as rich and fertile a soil as ours is, and the finest climate known, and be relied upon to disappear. Until this theory could be proved, our quarantine against Eastern trees is the only safeguard.

The following is from the San José "Daily Herald" of December 19, 1891:

Everybody concerned in the prosperity of Santa Clara Valley should do his utmost to prevent the importation of Eastern trees. All the pests that have ever been found in our orchards have been imported into the State through the cupidity of persons having trees to sell, or the ignorance of those who have planted orchards. It has cost a vast amount of money and immense trouble to rid ourselves of these pests, and now it is purposed to import the curculio, the peach-borer, the yellows, and a hundred other pests that have ruined many orchards in the Eastern States, simply to make money for Eastern nurserymen and their agents. This is a crying shame, and the men who have fought for so many years to bring the growing of fruit in this valley to its present high state of prosperity, would be fully justified in taking every imported fruit tree and burning it. But there is no necessity to proceed to violence. The laws of the State, if strictly enforced, are sufficient to protect the public interests from rascality of this sort. All the responsibility of enforcing the law should not be laid upon the State Quarantine Officer. He should be backed by all the influence and authority of the various organizations of fruit growers, as well as by every individual interested in the business. If we permit these trees to be planted in the valley, we deserve to lose all the advantages we have gained by our vigilance and intelligence so far.

Let it be distinctly understood that if the pests now prevalent in the Eastern States once obtain a foothold in California, it means the absolute ruin of the fruit industry. Many of them are kept in check by the severe winters of the East, but in this climate of perpetual spring they would multiply and thrive until they would soon defy all efforts to dislodge them. Let the curculio, for instance, once get into our orchards, and it will be the last of our magnificent prunes and apricots. Those of us who are familiar with the ravages of this pest, know that it often does not leave a single sound prune or peach in the orchards for miles together.

Too much vigilance cannot therefore be exercised in this matter, and the "Herald" urges every fruit grower to use his utmost efforts, not only to prevent the planting of trees from Eastern States, but to aid the State Quarantine Officer in destroying them. We cannot afford to take any chances in this matter; all our future prosperity depends upon prompt and vigorous action.

The following is from the "California Fruit Grower" of November 14, 1891:

A local paper states that a prominent horticulturist of Kern County intends to import a number of yellows-infected peach cions from the East and insert a lot of the buds in the peach trees of his orchard. This he is going to do, so it is stated, in the interest of science, to determine whether the peach yellows will thrive in the peculiar climate of California. He proposes to "quarantine the trees," and presumably the air, birds, and insects of the region as well. We have heard of lots of fool-hardy experiments in our time, but this caps the climax. It would be a good idea to box up this horticulturist and send him to the World's Fair. California is too slow for such a genius, and his inquiring mind should have a broader latitude. The fruit growers of California are willing to let science wrestle with the peach yellows on the other side of the Rockies, and the man who imports the disease into this State under any pretext whatever will make for himself no end of trouble and will find his name in very bad odor. Original investigation is to be encouraged; but when it comes to "bringing smallpox into one's family to see whether the children will sicken and die from it or not," it is time to call a halt.

I have taken measures to ascertain who this party is that intends to propagate the disease for experiment, and will try and prohibit him from carrying out such foolish ideas, and through which means the disease might be introduced, greatly to the injury of the fruit industry.

The publication of resolutions of warning by the Board, and a pamphlet in which the disease was described, together with a map showing the districts affected in the East, and its rapid increase, have had a very beneficial effect in preventing many carloads of cheap Eastern trees from being landed in this State. The various counties have appointed County Boards of Horticultural Commissioners, and it can safely be said that the interests of the county each represents are not overlooked, and all are doing good and effective work. The following letter from a large dealer in Eastern trees is added, to show that the warnings thrown out have not been altogether "moonshine:"

SAN JOSÉ, November 5, 1891.

SIR: I have finally decided, by advice of my friends in the East, not to risk the annoyance of shipping in any Eastern peach trees.

The following is from the Riverside "Press" of November 14, 1891:

We have just received a letter from a prominent Missouri nurseryman, complaining bitterly of the action of Secretary Lelong and the California State Board of Horticulture for their action in condemning the peach trees grown east of the Rocky Mountains, because of the danger apprehended from the "yellows" among them. He charges the Secretary with having been subsidized by local nurserymen, and asserts that much Eastern stock is being carried into California by way of the Washington and Oregon nurseries, in spite of the prohibition. He claims that the nurseries in Missouri are entirely free from the trouble feared, and thinks he should be allowed to ship trees raised from the seed of trees grown in that State, where no infection exists. He has spent thousands of dollars to prepare himself to supply the California trade, and feels that the quarantine works an unjustifiable hardship upon him, and compels the Californians to pay an excessive price for their trees. We admit that the radical course of our officials seems hard on the outside nurserymen, but if it postpones for years the advent of the "yellows" into this State, it will prove a fortunate thing for the orchardists and the State at large. There are enough nursery trees of all kinds in this State to plant as many acres as the growth of the market will justify, and if the action taken does limit tree-planting a little, it will not be an unmixed evil.

It is not surprising in the least that they should complain bitterly at not being allowed to dump their infected trees in our State. For several years this State has been used as a dumping ground for all Eastern and foreign trees, and on this account many new pests have made their appearance here. Why should the practice be allowed to be continued longer? There is no reason why the people should not grow their own stock, and avoid the risk of sooner or later having to abandon their orchards, which they must do if the disease ever gets a foothold here, as nothing can cure or stop its ravages.

The following Associated Press dispatch tells us of a measure now before Congress:

WASHINGTON, January 4, 1892.

Congressman Caminetti has prepared a bill of great importance to the horticulturists of California, and he will introduce it to-morrow if possible, with the intention of having it reported next week, thus giving it a place on the calendar. It will prohibit the interstate transportation of trees, plants, vines, and nursery stock infested with scale insects, codlin moth, or other pests, with their eggs or larvæ.

The bill provides heavy penalties for violations of the law, and covers every loophole of escape so well that violations will be extremely hazardous. Owners or agents who ship infected trees or plants are liable to a fine of \$1,000, or imprisonment for one year, or both. Railroad, ship, steamship, express, or other transportation companies, if caught in the act of shipping such trees or plants from one State or Territory into another, are also liable to pay a penalty of \$1,000. It is not necessary to convict them of a specific charge of carrying from one State to another, but if dangerous trees are found in their possession, consigned to another State or Territory, sufficient proof will have been acquired to convict. The penalty will be recovered by a civil action brought in the United States Circuit Court. Foreign railroad or steamship companies are equally liable.

To add to the stringency of the law, conductors, masters, captains, or agents in whose

care infected plants are found, can also be fined \$250 each, or imprisonment for three months, or both. The Department of Agriculture is empowered to prepare rules by which transportation companies, and their officers and agents, as well as United States officers, can guard against the violation of the Act. The department may also appoint agents, whose duty it shall be to enforce the law. Where States, as in the case of California, have Boards or Commissions empowered to guard against the introduction of dangerous pests, the Department of Agriculture may appoint such Board or Commission, provided no expense is incurred by the United States in so doing.

This bill carries no appropriation and may pass.

The following is from the "Pacific Rural Press" of January 16, 1892:

There is no more important item in our local agricultural affairs just at present than the issue which is being forced on the practical exclusion of Eastern-grown peach, plum, and apricot trees, because of the ravages east of the Rocky Mountains of the dread disease known as the "yellows." This issue, interfering as it does with courses of trade which have long prevailed, naturally excites opposition among Eastern tree growers, and upsets the calculations of local tree dealers who have hitherto relied, in whole or in part, upon the importation of Eastern-grown trees.

Probably no measure can be adopted without interference and hardship to some people. We sympathize with Eastern tree growers who have laid out their future upon sale of stock in California. Some of them have been very enterprising in propagating the varieties our planters desire, and have undertaken, at large expense, to procure buds from California orchards. We do not wonder that they feel aggrieved, and that they protest against the position now taken by California fruit growers at their public meetings and through the State and County Boards of Horticultural Commissioners. We have received a number of communications on this subject from Eastern parties, which enlarge upon the grievousness of the situation in which they are placed, and we sincerely regret that they have to suffer in the ways described.

And yet what can California do otherwise than she has done? Here we are with a vast and growing peach interest. It is by much the greatest deciduous fruit interest of the State at present. More than this, we are free from this terrible disease which destroys peach orchards almost with the rapidity of fire or tornado. One cannot read the most conservative reports on this subject, such as appears in the Government publications, without being appalled at the insidiousness, the swiftness, and the effectiveness of the scourge. There is no pest or pestilence among fruit trees which can compare with the but little understood malady known as "peach yellows."

In view of these things, what can we do but protect ourselves? To weaken or to provide for future restriction may be to "lock the door after the horse is stolen;" the animal is now in the stall, vigorous and healthy, and promising—let the doors be locked at once.

It has been charged that this movement is at the instigation of the California nurserymen, and is for the purpose of corraling locally the trade in trees. This is not true on the whole, and, in fact, we believe they have had very little or nothing to do with it. Perhaps an indication of this may be found in the fact that many California nurserymen expected to handle considerable quantities of Eastern-grown peach and prune trees this year, and had orders placed for them which they, in some cases at least, countermanded as soon as they knew of the stand taken at the Marysville Fruit Growers' Convention. The result will undoubtedly favor the local growth of nursery trees, but, unless we are very much mistaken, our California nurserymen had very little to do with the incisive action which has amounted almost to a practical exclusion of Eastern trees.

Again, the present California stand on this subject is not a local scare. It comes about through Eastern publications as to the character of the yellows and the intensity of its ravages. Current Eastern reports, backed up by Government investigators, must be charged with this protective action by the California fruit producers. Just as we write the mail brings us a new Government publication on this question in its most startling phases. It is entitled "Additional Evidence on the Communicability of Peach Yellows and Peach Rosette," and is by Dr. E. F. Smith, the Specialist of the United States Department of Agriculture, who has been engaged upon this particular investigation for several years. Let the Californian read the following quotation, and see that his protective action is not too early nor too incisive; and let the aggrieved Eastern nurserymen also read it and perceive that it is not an issue forced by local nurserymen, upon selfish ground. We quote from Dr. Smith as follows:

"It is proper to state, however, that the losses continue in the infected districts; that the disease has appeared in new localities, and that regions now healthy are also threatened. The yellows is certainly as far south as southern Virginia, and probably as far west as Arkansas and northeastern Texas. Peach growers are earnestly advised to stamp out the disease upon its first appearance, and are warned against the importation of trees from infected districts. These remarks apply with especial force to the Pacific Coast; and in this connection it is well to remember that the apricot and almond are also subject to the yellows. It would be much safer for the Californians to grow their own peach trees than to introduce any from the eastern United States. If trees are imported it should be known beyond question that they are from regions where this disease does

not occur. The mere fact that the nursery stock is healthy at the date of shipment is not a sufficient guaranty that it will continue so."

This is warrant for all California fruit growers are doing, and it should be sufficient to disarm criticism. This State cannot afford to proceed longer in defiance of this disease, but is justified in the most stringent measures for its exclusion.

It is, perhaps, natural that the first thought of those who are temporarily troubled by the refusal of Californians to receive their trees should be retaliation. We are not surprised, then, to find one Eastern tree grower writing us in this way:

"Our only recourse will have to be to get similar laws passed by this and adjoining States to exclude California fruit, on account of its sanitary condition. We think, if we try, we can get laws that will operate as much against the fruit growers of California as they can be, excluding our stock."

This is a heathenish threat, and none, perhaps, will be more ashamed of it in a little time than those who propose it. It is not to be feared on our part, for it is idle and impracticable. No Legislature could be made to adopt any such enactment, nor could facts be shown which would justify it in the minds of any fair-minded men. Our Eastern friends in the nursery line, before any such venture could be undertaken by them, would remember that such action would be against their own customers and friends, and in many cases against their own investments. We look upon the threat as merely a manifestation of chagrin, resulting from misapprehension of the motives which prevail in excluding trees from doubtful or infested localities. Usually the ill temper which arises upon misapprehension quickly passes away.

That the Eastern tree dealers are greatly exercised over the attitude of California in regard to the importation of diseased trees, is shown by the letter printed below, which appears in the San José "Mercury" of January 19, 1892, which was received by a nurseryman of San José. It will be seen that there is a desire to retaliate by urging Congress to remove the protective tariff from foreign fruits in order to injure the California industry. There is hardly a doubt, however, but that such an effort would fail, for no matter how great the pressure brought to bear, Congress would not be apt to lend itself to such a heathenish movement, the sole object of which is to ruin the great industries of California.

The letter reads as follows:

NEWARK, WAYNE COUNTY, N. Y., January 11, 1892.

DEAR SIR: I do not think that it will be for the good of the fruit growers of California to have your Commissioners burn any more Eastern trees. I have letters from three of the largest nurserymen in the East asking me to attend the January meeting of the New York State Nurserymen, and make a statement of what I know about the way that the Eastern nurserymen have been treated by California Commissioners; and also asking me to go to the National Convention which meets in June, and make the same statement there. The object of this request is to have all the nurserymen in the East join in a combination to get Congress to take off the duty on raisins, on apricots, and on prunes, that are imported from the Mediterranean, and the reason why they want this done is because that they believe, and I would not wonder if it were true, that all the laws that have been passed lately ruling the Eastern trees out of California, have been enacted at the request and instigation of California nurserymen for their own selfish purposes. There is no doubt that the wholesale grocery trade, which amounts to a good many thousand men, will join the nurserymen in this movement, and if they succeed in doing what they propose to do, it would be a death blow to the fruit interests of the State of California, as it would let in all the Valencia raisins, all the French apricots and prunes, all the German prunes, and Turkish prunes, without any duty whatever. I have refused so far to grant their request, but it is a question with me whether I should not do as they have asked me, and give the full knowledge that I have of what has been done in California to rule out the Eastern trees without good cause. I think it would be well for you to consult some of your leading men, if you know them, in California, and see whether this thing had better go on until it has killed all the green and dried fruit interests of California, as it surely will in the line of raisins, apricots, and prunes. A duty of 2½ cents per pound on prunes, apricots, and raisins is a great protection to the planters of California, and if this was once repealed it would be a hard matter to get it back again. You can, no doubt, see what the power of the Eastern nurserymen would be, joined together with the wholesale grocers, to move Congress, especially if they show up the facts of the case, that the nurserymen of California have instigated a law, under cover of protecting the planters from insects, to destroy all the Eastern trees that come there. You will possibly remember that Minnesota enacted some such a law to protect her farmers in the line of some item, which, I think, was the importation of dressed beef. This did not last long, as the flour that was manufactured in Minneapolis and St. Paul was ruled out of different markets, so that they had to repeal the law against the importation of beef. I would like to have you consult with some of your leading men

and give me the best information that you can as to what effect this would have upon the planters of fruit gardens in California, and do it at your earliest convenience, as there will be a meeting of nurserymen the last of this month in the State, and probably a semi-annual meeting called of the National Convention of Nurserymen at an early date.

Yours truly,

Commenting upon the above letter, the San José "Mercury" of January 20, 1892, says:

One of the most extraordinary exhibitions of the folly into which spiteful feelings will betray men was made in the letter of Jackson & Perkins, of Newark, New York, which was published in the "Mercury" yesterday. These gentlemen begin by asserting that "it will not be for the good of the fruit growers of California to have your Commissioners burn any more Eastern trees." This assertion is followed by a statement that the New York nurserymen propose to get the National Nurserymen's Convention and the wholesale grocers of the East to combine, for the purpose of inducing Congress to take the duty off prunes, raisins, and apricots, by way of retaliation on the fruit growers of California for refusing to receive into this State fruit trees from the East; and the plain warning is given that unless we consent to receive Eastern trees, this form of retaliation will be carried out and fruit growers deprived of the benefits of protection. It is difficult to conceive how such a policy could have been devised by men who have brains enough to carry on any business whatever. The writer asserts that the action of our Commissioners, in burning Eastern trees sent to this State, is due to a desire to prevent their competition with California nurserymen. The assertion hardly merits the trouble of contradiction. No trees have been burned in this State, nor sent back to their owners, unless they have been found to be infected with some form of pest or disease; and when they have been found to be so infected, it is not so much the California nurseryman who advocates their burning as the California orchardist. The investigations of the Government have found that the dangerous disease "the yellows" has now spread all over the East from Delaware to Kansas, and from Michigan to Georgia, and experiments have shown that it is readily communicable from one tree to another. Under these circumstances our orchardists would be foolishly reckless if they did not strive, by every means in their power, and in that of the State, to keep the disease away from every part of California.

As for the threat of retaliating, by getting Congress to repeal the protective duty on our dried fruits, we can only say that this seems to us a little bit the most brainless bluff we have heard in a long time. We have no intention of denying that the National Association of Nurserymen is a most reverend, grave, and potent body, and we admit that where its dignity is augmented by an alliance with the wholesale grocers of New York, it becomes august and worthy of doing obeisance to; nevertheless, it is not bigger than the United States by several immense degrees. Congress knows very well that the question of protection to American industries was submitted to the people four years ago, and the distinct, emphatic answer given to it is still visible to men in the Senate and the White House, and plainly readable to all in the McKinley tariff. It is not likely that any statesman, or even a politician, will be induced to believe that the decision of the people thus given can be overruled by the threatening nurserymen. Congress will not undertake to repeal the duties on dried fruits. They are a part and parcel of that great system of protection which is the animating spirit of our industries, and to which the great body of Americans are heartily devoted. The threat of retaliation, therefore, is as silly as the assertion that Eastern trees are burned in the interest of our nurserymen is unfounded, and taking the whole thing into consideration, we are quite sure that it will be for the good of the fruit growers of California to burn as many more Eastern trees as our Commissioners decide ought to be burned.

The San Francisco "Examiner" of January 20, 1892, commenting upon the same letter, says:

The threats of the Eastern nurserymen to be revenged on California for the action of the Horticultural Commissioners in seizing infected Eastern nursery stock can be borne with equanimity. The hint sent out to the California fruit men that the Eastern nurserymen will join hands with the wholesale grocers to have Congress take off the duties on raisins, apricots, and prunes will cause no anxiety. California is not to be frightened by such a possibility. If Congress will take off the duties on the articles they use, California growers will consent to have the tariff taken off the things they sell. But Congress is not likely to listen to any band of nurserymen who appeal to it for the noble purpose of being revenged for not being allowed to sell diseased plants in California.

So far from relaxing any of the protective regulations enforced, California is determined to strengthen them. The orchardists of the State have had some experience with imported pests and diseases, and will keep from having any more, if that is possible. They have paid some millions of dollars for their experience, and intend to avoid further loss from the same cause. There are many fruit pests and tree diseases in the East that have never entered this State. The exemption of California from their ravages has been

a matter of good luck rather than of foresight and precaution, for little attention has been attracted to the subject of quarantine or disinfection of imported stock, and none at all to its exclusion till after the disastrous experience with the cottony cushion scale. The early orchardists had an idea that the climate of California was fatal to pests. This belief resulted in bringing a large number into the State, and it is now evident that a fruit pest will thrive where the fruit it lives on will flourish. This is what makes it necessary to be strict with Eastern nursery stock. There are some orchardists who are willing to risk the destruction of their trees and the loss of thousands or millions of dollars to the State for the sake of saving a little money in the first cost of the orchard. But the main body of the orchardists know their interests too well to consent to any relaxation of the precautions that have been taken. If the Eastern nurserymen do not want to send their trees here under such conditions, California will manage to get along well without them.

There have been various assumptions that the action of the State Board of Horticulture is one of persecution, leveled against Eastern nurserymen in the interest of California tree growers. An imputation of this character is too small to require serious consideration. Suffice it to say, that no member of the Board, nor any of its officers, has ever lent himself to so small a business as boycotting any one. The statutes of California, providing for the preventing of the introduction or spread of insects or diseases injurious to our fruits, are general, and are not in any manner aimed at the Eastern nurseryman, nor do they reach in any way stock that is not infected with diseases or pests that may endanger our orchards. Eastern trees, or trees from any foreign country, may be imported into California in any numbers, provided they are not infected.

The laws which have been enacted to protect the horticultural interests of the State are general, and people, whether residents of California or not, are presumed, and conclusively presumed, to have notice of its provisions, and no one in any prosecution under these Acts can plead ignorance of their provisions.

It is incumbent upon every orchardist to disinfect all fruit trees grown on lands infected with any insects, or by any contagious disease known to be injurious to fruit, etc. This not only applies to home-grown trees, but to any that may be brought from any districts, whether in the United States or in foreign countries.

If the Eastern nurserymen had trees perfectly free from pests and diseases there would be no trouble. The fact of the deadly yellows and rosette abounding in many of the Eastern States, and destroying the peach orchards everywhere, has caused every load of Eastern trees to be rigidly inspected. If the slightest trace of infection is found the trees are condemned, and proceedings at once instigated to have them destroyed. If one tree infected with the yellows gets in here and afterwards the disease develops, the duty on foreign fruit can be taken off, for there will be no need of protection; for if the disease spreads with the rapidity it does in the Eastern States, California will have no fruit to protect, and the disease will never be gotten rid of, as there is no cure for it.

There is more danger of ruining the California fruit industry by importing diseased trees than by removing the tariff. We might recover from the effects of tampering with the tariff, but if the yellows ever gets here it will come to stay, and California will never recover from its effects.

Lastly, the districts in the Eastern States where the yellows has appeared were once flourishing orchards, and now are nothing but leafless, bare-limbed trees and trunks. California is so situated that careful espionage should be exercised over every importation, and it is the

bounden duty of every citizen interested in the future welfare of the State to keep out all known tree diseases and fruit pests. The fruit interests of California bid fair to become the greatest of all in the world, and from it many families will derive comfortable support in years to come, and some will amass exceeding great wealth. Therefore, these interests deserve, aye, they demand *protection*.

HOP APHIS.

The English hop aphis (*Phorodon humili*), which has proved such a menace to the hop industry of England and many sections of the East, has made its appearance in several parts of Oregon. In August (1890) several packages of infested hop leaves were received from Lane County, Oregon, which, upon examination, proved to be the *Phorodon humili*, or English hop aphis. I at once addressed letters to the Entomologist of Oregon, Prof. F. L. Washburn, and asked him, in view of the threatened danger from this pest, to take every means possible to stop its spread into this State. Professor Washburn later visited the districts along the Mackenzie River, from where the specimens were sent, and found those districts badly infested, but the injury was not altogether confined to that locality or to Lane County. Marion, Polk, Benton, and other counties suffered to a greater or less extent. The results of Professor Washburn's observations were immediately published, and hop raisers were urged to destroy, by burning, all unremunerative plum thickets, upon which the *Phorodon* lay its eggs, and from which they spread onto the hopvines soon after hatching. As the *Phorodon* has made its appearance so near to us, the hop growers are urged to examine their vines, and if the aphis is found upon them to at once communicate with the Entomologist of this Board, that it may be promptly investigated. The importing of hop plants from Oregon should also be avoided, as in this way the hop aphis is taken into new fields.

From the following, taken from the "Oregonian" of June 5, 1891, it appears that the hop aphis is also in Washington:

At the recent meeting of the Hop Growers' Association of Washington, C. P. Hayes, one of the most extensive hop growers in the State, in course of an address said, in reference to the hop industry of Washington, that "there was no concealing the fact that the situation of the hop interest is exceedingly critical at this moment. There is no mistaking the fact that the hop louse, the greatest enemy the hop grower has even known, is here to-day in most of the yards, and it will gain a foothold in all. Something must be done or the crops will receive untold injury. I have prepared myself to fight the insect, and I want every man to do the same."

INFECTED TREES FROM TAHITI.

A shipment of three hundred and twenty-five thousand orange trees arrived last June from Tahiti, with no less than nine different kinds of insects upon them; of these, two are entirely unknown to this coast, and are very injurious; one of these in particular proved hard to exterminate. The one referred to lives under the bark, and therefore cannot be killed with remedies. This cargo was placed in quarantine immediately upon arrival. The danger of these pests spreading being so great, proceedings were instituted before the Superior Court at Los Angeles. The Court, instead of ordering the trees destroyed, ruled that they must lay in quarantine until the importers prove that all insects upon them are dead. Since that time most of the trees have perished, and those

that are still alive have been repeatedly treated by the owners, with only partial success in destroying the insects. The Attorney-General will soon again institute proceedings, and it is to be hoped that the Court will order them destroyed.

This and many other cargoes that have arrived have required personal attention of the Quarantine Officer, and a deputy was appointed temporarily to inspect all ships that arrive from foreign countries. At present we know of large consignments of trees that will begin to arrive soon from the East, and every precaution will be taken that no new pests be introduced. This division has from time to time issued such instructions and advice as occasion required.

GRASSHOPPERS AND CRICKETS.

The grasshopper plague this year appeared in many districts in the State. It is not expected that they will appear the coming year, unless there may be species that did not hatch this year.

Ed. M. Ehrhorn, who was delegated to make an inspection of the northern part of the State, reported as follows, viz.:

Having received orders from you to proceed to Yreka on July 1st, I left San Francisco on the evening of the same day.

At Cottonwood I began my observations. The country here has a few scattered orchards on red soil. I noticed a few grasshoppers, and some young trees were protected with bags. At Anderson the trees and vines looked well. At Redding the soil is a gravelly loam, and the orchards and vineyards are in fine condition. From Redding to Sisson I found good land, and orchards looking well. At Montague I noticed the first crickets. From here I moved to Yreka. I expected to find this place in trouble, but did not find any crickets. Inquiring about these insects, Hon. G. A. Robertson kindly gave me letters to Clarence Prather, whose ranch is about three miles north of Montague. On July 3d I visited his ranch. The crickets here were very abundant. They seemed to feed mostly on natural grasses and weeds, but would also attack cereals, especially barley. Mr. Prather informed me that these insects appear every year, but they were extra numerous this season. They are good food for hogs and turkeys, although the latter soon get tired of them. Bands of hogs are turned into grain fields, and relish the insects, which seem to fatten them. Although these insects are called crickets, they are not real crickets, but shield-backed grasshoppers, of the genus *Anabrus*, family *Locustidae*. The specimens I found resemble *Anabrus simplex*. A peculiarity of these insects is, that when one gets injured the others eat the body of the injured. About 10 o'clock A. M. they climb the fences to sun themselves, and the fence boards are so thickly covered that they look black. About 1 o'clock P. M. they crawl down and feed till 5 P. M., and then crawl up on the fences and rocks. The male stridulates with two small wings hidden under the pronotum. The pronotum is of enormous size, covering the two other thoracic segments, and is well rounded behind.

The female has a long ovipositor, and was already depositing her eggs. I arrived here too late in the season to observe many of their actions. A few females had a white glutinous matter attached to the vulva, some more and some less. When I dissected the ones with a great quantity of matter, I found the eggs not thoroughly developed; and in those with less matter, the development was greater. I found places where eggs had been deposited, and counted from twenty to thirty eggs in each sac. This sac is from one quarter to one half of an inch long, and of a light brown color. All the insects were infested with *Astoma gryllaria* (Le Baron), some very much so.

I dissected over two dozen grasshoppers, and did not find a single sign of an internal parasite. The males and females seemed to be very evenly divided.

Poisoning does not seem to affect these insects. I tried three parts of Paris green to ten parts of flour, and three parts of arsenic to ten parts of flour, both dry and wet; they ate it, but did not die nor seem to suffer. Strychnine was also tried in the same mixture with bran, but of no use, because enormous quantities were required to lessen their numbers. I placed one of these insects in cyanide for one hour, and when removed it was still moving, but afterwards died. After cutting the head off of one the muscular movements were observable for an hour. The only way to reduce the number of these insects is to find their laying grounds and turn the soil over. The winter of 1890-91 was a very mild one, and farmers say that the soil generally freezes very hard, but did not do so last winter. No doubt climatic influences have a great deal to do with the number of insects.

On July 4th I stationed myself at the place of Mr. Fred. C. Miles, near Penryn. On my way from Sacramento I observed very few hoppers. At Rocklin I noticed some trees covered with bags, where the hoppers had given trouble. At Loomis and Penryn, as well as at Newcastle, the hoppers were very numerous, eating everything they could



reach. When they had no wings, a wash of one fourth pound of whale-oil soap to one gallon of water was found useful in keeping them in check. Poisons have been tried, such as Paris green and arsenic, in proportions of three parts of poison to ten parts of bran or flour, but the insects are very restless, and it does not kill enough to pay for the trouble. Phosphorus and strychnine in the above mixture were tried, and killed them.

The best protection to young trees is to cover them with cotton bags. These grasshoppers not only destroy the leaves but also the fruit. They eat the skin off peaches and apricots, which soon turn sour.

Smoking was tried, but did not affect them. The only way to prevent the pests next year is to watch where the females deposit their eggs, and then either plow or dig up such places.

Gustav Eisen, who was detailed to make an examination of the grasshopper plague in the upper Sacramento Valley, reported under date of June 10, 1891, as follows:

Grasshoppers are breeding in large quantities in portions of Tehama County. Their breeding places are generally low, open places, sometimes many miles apart. In these breeding places they are now seen in very large quantities, hopping towards the north-east principally, and slowly moving in that direction. Between these breeding centers hoppers are also seen, but in very much smaller quantities. Few hoppers have as yet attained the winged stage, and by far the vast majority are now only half grown. The latter do the principal damage. So far no very great damage has been done in this county, and only the outskirts of some orchards and vineyards have been attacked, and small, outside trees defoliated without suffering any permanent injury. I visited the vicinity of Red Bluff, seven miles north and east and twenty miles west and south, and found the quantity of grasshoppers to be much less than in 1885. They are of at least five different species, those yellowish and striped being the most common. I found no crickets anywhere here.

The orchardists are using several remedies. One consists of driving the grasshoppers by means of sacks, either tied to sticks or tied together in streamers. The hoppers are driven to dry, grassy plots, which are afterwards fired. Some farmers scrape up the grasshoppers by the aid of buckets. The hoppers ascend the tops of the alfalfa early in the morning, or rather roost there, and are caught in the same way as insects are caught with a net. They are thence transferred to sacks. In this way one man caught thirty pounds of hoppers in one hour's time, and three men caught five hundred pounds in three hours. The damage to this alfalfa field was considerable.

A very successful contrivance I saw used consisted of a long trough made of sheet-iron, five feet long, two feet wide, back two feet high, front three and one half inches. This is first filled with coal tar, or with a mixture of coal oil and water, and is then dragged between the rows by two boys, by means of two ropes twelve feet long. The hoppers fly up and, striking the high back, fall into the coal tar mixture.

In Capay Valley, in Yolo County, I found few grasshoppers; indeed, they were here rather scarce; but on the plains, at the entrance to this valley, the hoppers were very numerous, and some little damage was done. Some vineyardists used here the arsenic and bran remedy. Around Sisson and further north the principal damage to crops is done by a cricket of the genus *Gryllus*, not by regular grasshoppers.

OTHER PESTS.

This State is as yet free from the plum curculio, and it is to be hoped that it will always remain so; yet we should not relax our efforts to keep it out. The fact that this insect has caused plum and apricot growing in many parts of the East to be abandoned, and that they are only grown where heroic efforts have been resorted to, should be enough warning for every one to do his utmost in preventing its introduction here.

In some sections a new caterpillar made its presence felt this and last year for the first time, attacking the walnut. It is a very serious pest, and as yet new to science, and we are in a quandary to know from whence it came. The larvæ attacked the trees in such immense quantities that the destruction of the foliage was only a matter of a few hours. As soon as observed, however, measures were taken to destroy them, which was done very effectually before they had done much damage.

In some of the prune districts several species of caterpillars also appeared, and so suddenly and unexpectedly that the growers were taken

unawares, and for a time it seemed as though they would devastate everything before them; but the fruit growers were not to be worsted, and promptly adopted measures through which the insects were put beyond the stage of destruction.

The season of 1891 opened with a most encouraging future before it, and it was predicted that it would be the most prosperous season for all fruits ever known in the State. Fruits of all kinds, flowers, etc., bloomed freely, vegetation of all sorts put forth as it had never before, and there was general rejoicing at the outlook of the season; but in the midst of this rejoicing came myriads of malignant insects, that stole from the growers a goodly share of their profits.

CHAPTER II.

SCALE INSECTS, AND REMEDIES FOR THEIR DESTRUCTION.

MYTILASPIS POMORUM.

[Figs. 1 and 2, Plate IV.]

Infesting the apple and other plants; not very common in the State, and principally found in old apple orchards. The scale of the female is mussel shape, more or less curved, of a purplish brown color, with the exuviae yellowish. Length, one sixteenth of an inch. The body of the female is light yellow. The last segment presents the following characteristics: The anterior group of spinnerets consists of from eleven to seventeen; the anterior laterals and posterior laterals each of sixteen to twenty-one. The median lobes are large and wide, with the sides parallel; they are only about three fourths as long as broad. Each lobe is narrowed on each side near the distal extremity by one or two notches, and then rounded. The second lobe of each side is about as wide as the first, and is deeply incised; mesal lobule with mesal margin as long as lateral margin of the first lobe, and rounded posteriorly; lateral lobule about half the length and width of mesal lobule, and similar in shape. Third lobule obsolete. The plates are long, simple, and tapering.

The eggs are white, and are arranged irregularly under the scale. The scale of the male of this species is usually straight, and of the same color as that of the female. At about one quarter of the length from the posterior extremity the scale is thin, forming a hinge which allows the posterior part of it to be lifted by the male as he emerges. Length, .06 of an inch. The male is translucent, corneous gray, with a dorsal transverse band on each joint, and the portions of the mesothorax and metathorax darker, or purple gray, with the members somewhat lighter.

According to climate and locality the young scale hatch from the middle of March to June. Color yellow. They begin to form the excretion after twenty-four hours, and in two to four days the insect is completely covered with a dense excretion, which increases as the larva grows.

MYTILASPIS CITRICOLA.

[Figs. 3 and 4, Plate IV.]

Infests citrus trees. Found principally on imported trees.

Scale of female long, slightly curved, and widened posteriorly. Brown, with a purple tinge; the exuviae brown, with delicate margin. Ventral scale is well developed and of a dirty white color. It is a single piece attached to the lower edge of the scale, and is more or less incomplete posteriorly. Length of scale, .12 of an inch. Color of female, pale yellow. Eggs white, and placed irregularly under the scale.

The scale of the male usually straight; of the same color as that of

the female, sometimes almost black; the larval skin light yellow. For about one quarter of the length from the posterior end the scale is thin, forming a hinge which allows the posterior part of it to be lifted when the male emerges. Length, .06 of an inch.

ASPIDIOTUS PERNICIOSUS.

[Figs. 5 and 6, Plate IV.]

Infests deciduous fruit trees. Insect of a grayish color, except the center, which is pale yellow, or sometimes reddish yellow. It is circular and flat, with the exuviae nearly central. Diameter, .08 of an inch.

Body of female yellowish, and almost circular in outline; segmentation is distinct; the last segment has the following characteristics: Two pairs of lobes are visible; the first pair converge at tip, are notched about midway their length on the lateral margin, and often bear a slight notch on the mesal margin near the tip. The second pair are notched once on the lateral margin. The margin of the ventral surface of the segment is deeply incised twice on each side of the meson, once between the bases of the first and second lobes, and again lateral of the second lobe. On each side of each of these incisions is a club-shaped thickening of the body wall. There are two inconspicuous, simple plates between the median lobes, and on each side two similar plates serrate on their lateral caudad of the first incision; three small plates serrate on their lateral margin caudad of the second incision, and the club-shaped thickening of the body wall bounding it, and three wide prolongations of the margin between the third and fourth spines. These prolongations are usually fringed on their distal margin. There are also some irregular prolongations of the margin between the fourth spine and the penultimate segment. The first and second spines are situated lateral of the first and second lobes, respectively; the third spine lateral of the second incision, and the fourth spine about half the distance from the first lobe to the penultimate segment. Eggs white.

Scale of male dark, and somewhat elongated when fully formed. Larval skin is covered with secretion; its position is marked by a nipple-like prominence, which is between the center and the anterior margin of scale.

MYTILASPIS GLOVERII.

[Figs. 7 and 8, Plate IV.]

Infests citrus trees, and principally found on imported trees.

Resembles *M. citricola*, but differs in being straighter and much narrower, and in color is yellow, varying to dark brown. Ventral scale white, very thin, and split longitudinally, showing eggs arranged in two layers. Body of female light purple; last segment yellowish. Eggs white when first laid, but become tinged with purple before hatching.

The male scale is similar in form to that of the female, but smaller and very seldom curved.

ASPIDIOTUS CITRINUS.

[Figs. 9 and 10, Plate IV.]

Infests citrus trees mainly; only attacks the fruit and leaves.

Female scale circular, with the exuviae slightly to one side; the scale is not as convex as in *A. aurantii*; the margins are wider, and a light

gray. The ventral scale is light colored, and remains attached to the upper one, making it difficult to remove the insect from the scale.

LECANIUM ARMENIACUM.

[Figs. 11 and 12, Plate IV.]

Infests apricot, cherry, plum, etc.

Color of adult female light brown. In the center of the dorsum is a prominent, shining, circular protuberance, from which radiate a number of small ridges; these are more noticeable upon the posterior half of the scale. From the convex center to the anus is a low carina, also noticeable in front.

Length, from .20 to .27 of an inch; width, from .12 to .15 of an inch; height, from .05 to .10 of an inch. Antennae tapering to the point, seven-jointed; joints 1 and 3 subequal; joint 2 nearly three times as long as joint 1; joint 4 slightly longer than joints 5 and 6; joint 7 is nearly the same as joint 3, and tapers to a point; a few bristles at the tip and upon each joint.

The eggs are smaller and lighter colored than those of *L. oleæ*. The larvæ are long, oval, light yellow, darker down the center, and can be distinguished from the larvæ of *Oleæ* in not having the four reddish brown marks upon the dorsum.

ASPIDIOTUS FICUS.

[Figs. 13 and 14, Plate IV.]

Infests citrus trees and shrubs only. Found principally on imported trees. Attacks only the leaf and fruit.

Scale of female circular, with the exuviae nearly central. The position of the first skin is indicated by a nipple-like prominence, which, in fresh specimens, is white, and is the remains of a mass of cottony excretions, beneath which the first skin is shed. The part covering the second skin is light red, and the remainder is much darker, ranging from dark reddish-brown to black; the thin part of the margin is gray. When full grown it measures .08 of an inch in diameter. The body of the female is nearly circular, and the color is white, with yellowish spots. Eggs pale yellow.

Scale of male much smaller than that of female. The posterior side is prolonged into a thin flap, which is gray in color.

Male light orange-yellow in color, resembling male of *A. aurantii*, but smaller, with shorter antennae.

AONIDIA (ASPIDIOTUS) AURANTII.

[Figs. 15 and 16, Plate IV.]

Infests citrus trees; attacks leaves, fruit, and branch.

Scale circular, resembles *A. ficus* in shape, size, and the nipple-like prominence. Color varies from light greenish-yellow to reddish-brown. The central third is as dark, and usually darker, than the remainder of the scale, and when the female is fully grown the peculiar reniform body is discernible through the scale, causing the darker part of the outer two thirds of the scale to appear as a broken ring.

Female light yellow in the adolescent stages, becoming brownish as

it reaches maturity. When fully developed the thorax extends backwards in a large rounded lobe on each side, projecting beyond the extremity of the abdomen and giving the body a reniform shape.

Scale of male smaller than that of female, and the posterior side prolonged into a thin flap. The part which covers the larval skin is often lighter than the remainder of the scale. Male light yellow, with the thoracic band brown and eyes purplish black.

The eggs have never been seen excepting in the female's body, but larvæ having been found under the scale, it is supposed that the female is viviparous.

REMEDIES FOR THE DISINFECTION OF TREES IN ORCHARD.

SUMMER REMEDY FOR PERNICIOUS SCALE ON PEACHES.

Potash	14 pounds.
Caustic soda (98 per cent)	8 pounds.
Lime, unslacked	5 pounds.
Fish oil, polar or seal	10 gallons.

Directions.—*First*—Dissolve the soda and potash by placing them together in about ten or twelve gallons of water.

Second—Slack the lime in the barrel in two gallons of water; then add the fish oil to the lime and stir well until the lime and the oil have turned to a thick batter; then add the soda and potash, water boiling hot, and stir well with a dasher for five minutes or more; then leave standing for about four or six hours; then fill up with cold water. Do not pour in all the water at once, but about two buckets at a time; stir well as the first two buckets of water go in, to prevent lumps. Use the following day. Apply cold, one pound to the gallon of water. In dissolving it do not boil, but weigh the amount to be used, place in a barrel, and on top of it pour hot water, about one bucket to every hundred pounds of material. After pouring in the hot water, stir lively with a dasher, until it is entirely dissolved; then reduce with cold water until sufficiently thin to pass through the strainer; then place in the tank and fill up with water; stir well, and it is ready for use; apply cold.

SUMMER WASH FOR PERNICIOUS SCALE, FUNGUS, ETC., UPON DECIDUOUS TREES.

Whale-oil soap (80 per cent strength)	20 pounds.
Sulphur	3 pounds.
Caustic soda (98 per cent)	1 pound.
Commercial potash	1 pound.
Water to make 100 gallons.	

Place sulphur, caustic soda, and potash together in about two gallons of water, and boil for at least one hour, or until thoroughly dissolved. Dissolve the soap by boiling in water, mix the two, and boil for a short time. Use the solution hot.

SUMMER REMEDY FOR PEARS AND APPLES.

Caustic soda (98 per cent)	10 pounds.
Potash	10 pounds.
Tallow	40 pounds.
Rosin	40 pounds.

Directions.—*First*—Dissolve the potash and soda in ten gallons of water. When dissolved place the whole amount in the barrel (fifty-gallon measure).

Second—Dissolve the tallow and rosin together. When dissolved add the same to the potash and soda in the barrel, and stir well for five minutes or so. Leave standing for about two hours; then fill up with water, stirring well as every bucket of water goes in. Use the following day, one pound to the gallon of water; apply warm.

ROSIN WASH FOR WINTER USE UPON DECIDUOUS TREES.

For Pernicious Scale and Lecaniums.

The following are the proportions of materials for the winter wash:

Rosin	30 pounds.
Caustic soda (70 per cent)	9 pounds.
Fish oil	4½ pints.
Water to make 100 gallons.	

Directions.—Place the rosin, caustic soda, and fish oil in a large boiler, pouring over them about twenty gallons of water, and cook thoroughly over a brisk fire for at least three hours; then add hot water, a little occasionally, and stir well until you have not less than fifty gallons of hot solution. Place this in the spray tank and add cold water to make the necessary amount. Never add cold water when cooking.

LIME, SULPHUR, AND SALT REMEDY FOR WINTER USE UPON DECIDUOUS TREES.

For Pernicious Scale and Lecaniums.

The following formula and directions, if properly carried out, will produce an effective solution:

Unslacked lime	40 pounds.
Sulphur	20 pounds.
Stock salt	15 pounds.
Water to make 60 gallons.	

Directions.—Place ten pounds of lime and twenty pounds of sulphur in a boiler with twenty gallons of water, and boil over a brisk fire for not less than one hour and a half, or until the sulphur is thoroughly dissolved. When this takes place the mixture will be of an amber color. Next place in a cask thirty pounds of unslacked lime, pouring over it enough hot water to thoroughly slack it, and while it is boiling add the fifteen pounds of salt. When this is dissolved add to the lime and sulphur in the boiler and cook for half an hour longer, when the necessary amount of water to make the sixty gallons should be added.

ROSIN WASH FOR CITRUS TREES INFESTED WITH RED SCALE.

Rosin	20 pounds.
Caustic soda (70 per cent)	6 pounds.
Fish oil	3 pounds.
Water to make 100 gallons.	

The directions for preparing this wash are the same as those given for the rosin wash recommended for winter use upon deciduous trees. August and September are the best months to spray citrus trees.

ROSIN WASH FOR NEWLY-HATCHED BLACK SCALE UPON CITRUS TREES.

Rosin.....	18 pounds.
Caustic soda (70 per cent).....	6 pounds.
Fish oil.....	2½ pounds.
Water to make 100 gallons.	

The directions for preparing this remedy are the same as given for the rosin wash for winter use upon deciduous trees.

WASH FOR BLACK SCALE ON OLIVE TREES.

Directions for making emulsion:

Kerosene oil (Pearl, 150° test).....	5 gallons.
Common laundry soap.....	1½ pounds.
Water.....	2½ gallons.

Dissolve the soap by boiling in two and a half gallons of water, and while boiling remove to another vessel; add the kerosene, and churn for fifteen minutes, or until a stable emulsion is formed. Afterwards dilute with six and one half gallons of hot water for each gallon of oil, and to the mixture add two and a half pounds of home-made soap, dissolved in hot water. Apply at a temperature of 140 degrees Fahrenheit.

ROSIN WASH FOR COTTONY CUSHION SCALE.

Rosin.....	20 pounds.
Caustic soda (70 per cent).....	6 pounds.
Fish oil.....	3 pounds.

The directions for preparing this wash are the same as those given for the rosin wash for winter use upon deciduous trees.

Or secure a colony of *Vedalia cardinalis*.

August and September are the best months to spray citrus trees.

GAS TREATMENT FOR SCALE INSECTS UPON CITRUS TREES.

The amount of cyanide of potassium (58 per cent) required for the different sized trees:

Height of Tree— Feet.	Diameter through Foliage—Feet.	Water— Fluid Ounces.	Sulphuric Acid— Fluid Ounces.	Cyanide of Potas- sium—Ounces.
6	4	2	1	1
8	6	4	2	2
10	8	6	3	3
12	10	10	5	5
12	14	14	7	7
14	14	16	8	8
16	16	18	9	9
18	16	20	10	10
20	16	22	11	11
22	18	24	12	12
24	20	26	13	13
26	20	27	13½	13½
30	20	28	14	14

Directions.—Cover the tree with an air-tight tent; place the necessary amount of cyanide of potassium in an earthenware vessel, pour over it

water, afterwards the sulphuric acid, and close up the tent for forty minutes.

FOR MEALY BUGS.

Mealy bugs are hard to exterminate, on account of the tender character of the plants they infest. Whale-oil soap (one half pound) and tobacco (one fourth pound) water (two and a half gallons) is the best remedy. Whale-oil soap solutions, however, can only be applied to hardy plants. Cold tobacco water (one pound tobacco, one and a half gallons water) can be applied to soft-wooded plants at any time of year. After the tobacco water has had its effect on the insects, one or two hours after application it should be washed off the plants. One or two applications will rid the plants of the mealy bugs.

The following sulphur and lime solution is also effective:

Sulphur.....	2 pounds.
Lime.....	1 pound.
Water.....	2 gallons.

Boil together for one hour, then add six gallons of water, or more water in case of very soft-wooded plants. In case of tender plants allow the mixture to cool before applying it. After it has been on the plants thirty minutes wash off with cold water.

FOR DIABROTICAS, OR SQUASH BUGS.

The best method for the destruction of the beetles is the application of a solution of Paris green—one pound to two hundred gallons of water. This application does not kill by contact, but by remaining on the leaves the beetles are poisoned while feeding upon them.

Paris green and sulphur—five ounces of the former to twenty pounds of the latter—have been used on the foliage of trees very successfully. The sulphur and Paris green are put into a sack, and the sack is tied to a long pole and shook over the trees. One application has driven away the beetles. This remedy should only be applied when the fruit is young.

FOR RED SPIDER OR YELLOW MITES.

The caustic solutions applied during winter for scale insects, and the summer remedy given below, have practically exterminated this pest on deciduous trees.

Summer Remedy.

Sulphur.....	3 pounds.
Caustic soda (98 per cent).....	2 pounds.
Whale-oil soap.....	25 pounds.
Solution (in all).....	100 gallons.

Directions.—Boil the sulphur and caustic soda together in about two gallons of water (this is done to allow the caustic soda to dissolve the sulphur). When the sulphur becomes dissolved, add the soap and boil until thoroughly dissolved, then add water to make in all one hundred gallons of solution, and apply warm.

FOR GRAPEVINE FLEA BEETLE.

Paris green is the most effectual remedy—one pound to two hundred gallons of water—but should not be used on vegetables under any circumstances, nor on fruit trees of very early ripening, unless after the fruit has been picked. Strong tobacco water is also very effectual in destroying the larvæ. Pulverized sulphur and lime (equal proportions) dusted over the plants drives away the beetles.

FOR RED-HUMPED OR LEAF CATERPILLAR ON PRUNE TREES.

The best remedy for this caterpillar is Paris green—one pound to two hundred gallons of water—but must be used when the insects are quite small, and the fruit also. The trees should be examined, and the remedy applied as soon as they are noticed. If they are allowed to increase and become large then the best remedy is hand-picking. Upon jarring the branches all the large caterpillars fall to the ground, and are thrown into a strong caustic solution, which kills them instantly.

In the bucket containing the caustic soda solution a wire basket is arranged, which fits closely down to the bottom of the bucket. Before moving to another tree, this basket is raised up and its contents (caterpillars) thrown away. In this manner the liquid does not require to be renewed often. Great care must be exercised in the use of Paris green at this season of the year; it should be constantly stirred when applying, and only used when the fruit is small.

FOR PEAR SLUGS.

Various substances have been recommended for the destruction of these slugs, and of all the remedies used none have been so effectual as the application of Paris green, the same as used for the leaf caterpillar, *i. e.*, one pound of Paris green to two hundred gallons of water. The solution must be stirred continually while being sprayed. It only requires to be strained when a fine spray nozzle is used. If a rubber disk be used in place of the brass plate, no straining is necessary, as all grains will blow through. Great care should be exercised in the time it is applied; if used when the trees are in bloom the pollen in the blossom will be washed away, and the blossoms will wither and fall off. It should never be applied until the fruit is fairly set.

FOR ROSE BEETLES.

The best remedy so far known to destroy this pest is by hunting for the beetles and destroying them. If this is done often, they can be exterminated.

FOR CURRANT WORMS AND CURRANT SPAN-WORMS.

Paris green is the most effective remedy—one pound to two hundred gallons of water, and even stronger; but under no circumstances should this be applied until after the crop has been gathered. Buhach is also effective—one half of a pound to ten gallons of water. Buhach can be applied on tender foliage without danger.

FOR ROSE SCALE ON ROSE BUSHES, ETC.

This scale is quite troublesome, and is very common throughout the State on rose bushes, blackberries, and raspberries. When blackberries and raspberries become badly infested, it is best to cut out and burn at once the old infested canes. The old infested wood of rose bushes can also be removed, without injury to the plant, and the balance of the bushes sprayed with a solution of strong whale-oil soap, one pound to the gallon of water, and applied warm. Strong caustic solutions injure the plants. The soap should be of the best. The raspberry and blackberry canes should be examined a few inches below the surface of the ground—this generally being loose, and thrown against the plants by the plow or cultivator, covers up part of the infested canes.

PEAR BLIGHT BEETLE.

The only remedy that can be recommended is to cut off the limbs when they show signs of infection, and burn them. The beetle attacks the trunks of trees as well as the limbs, therefore the trunk should be well protected. Young trees (especially when pruned high) generally suffer considerably from the sun's heat through the summer, which causes the sap to ferment and ooze from the bark, and attracts the beetle.

FOR COTTONY GRAPE SCALE.

This scale is seldom met with. A parasite keeps it in check, and on that account it does not increase. Being a soft scale, the hot sun also kills many of the young insects. During the time the vines are dormant—in the winter—the prunings should be carefully gathered and burned. The body of the vine is then sprayed with a solution of whale-oil soap, one pound to the gallon of water, and applied warm.

FOR CANCKER WORMS.

The caterpillars are easily destroyed by the application of Paris green—one pound to two hundred gallons of water—but this should be applied only when the fruit is quite small. The females, being without wings, can be prevented from ascending the trees to deposit her eggs by placing on the trunks of the trees bands made of tarred paper, on which substances like printers' ink, slow-drying varnish, etc., are smeared from time to time. In ascending the tree the legs of the females become entangled and they soon die.

A good protector is made and placed on the tree, as follows: Take a strip of tin four inches wide, of sufficient length when encircling the tree to leave a space of about six inches. The upper edge of the tin is bent over so as to receive beneath it a piece of muslin as long as the tin and eight inches wide, to be held in place by pounding down the tin. The ends of the tin are bent in opposite directions, so that they can be hooked together. Placing this around the tree with the cloth upward, the cloth is to be firmly bound to the tree by a cord. In the above method the insects, which will collect in large numbers below the obstruction, may be easily killed by brushing them with kerosene oil,

without injury to the tree, unless an excessive quantity (a very little is needed) should be used.

The principal object should be to prevent the females climbing the trees in the fall. If this is properly attended to, and the trunk under the band scrubbed in the spring to destroy any eggs that have been deposited thereon, there will be no trouble from canker worms. In infected orchards, where this precaution has not been taken, the trees should be thoroughly sprayed in the winter with one of the washes recommended for deciduous trees. Should any hatch in the spring, the trees must be immediately sprayed with one pound of Paris green to two hundred gallons of water. This must be constantly stirred when applying, otherwise the Paris green will settle on the bottom of the tank.

FOR CODLIN MOTH.

The time to apply remedies against this insect is in the spring and summer. The winter work must consist in reducing the hiding places for the cocoons. As these are often many inches below ground, the soil should be removed and the bark scraped. The arsenical mixtures have proved the most successful.

Strength to be Used.—Spray early pears and apples once with one pound of Paris green to two hundred gallons of water, when just out of bloom. Spray fall and winter apples (second application) ten days later, while the blossom ends of the apples are still turned upward. Use the Paris green without any additions, simply stirring the liquid continually, straining it before using. In isolated places probably one spraying of Paris green will suffice; however, when the orchard is surrounded with infested orchards not treated, two applications will be necessary.

Possible Danger of Using the Arsenites.—The greatest care should be taken in handling the arsenic mixture, avoiding getting any in cuts on the hands, also preventing either human beings or animals from eating the young fruit. Stock should be excluded from the orchard for at least six weeks. Paris green should not be applied after the fruit has commenced to turn downward; and if an overdose be used on a tree, the foliage will be affected to such an extent that the leaves will fall, and with them the fruit.

Band System.—As an additional help in decreasing the last broods of codlin moth, the banding system is certainly worth following; but besides putting burlap around the tree about one foot from the ground, rags should also be put on trees in the crotches, and they should be examined, as well as the bands, once a week.

FOR WOOLLY APHIS.

Remedies for the Root Form.—Liberal dressing of ashes has a tendency to discourage the aphis, especially in moist localities, where heavy dews often moisten the ground.

Gaslime.—About one and a half to two shovelfuls placed around each tree in such a manner that it will not come in direct contact with the bark of the tree, is one of the best remedies. Add to this wood ashes, placed directly around the base of the tree to the depth of one inch.

Thus the migration of the aphis to the upper part of the tree can be prevented.

Remedy against the Branch Form.—When the aphis appears on the branches, their presence is noticed by their white cottony covering; the parts affected should be touched with a small brush dipped in a rosin solution; by diluting it sufficiently it can be sprayed on larger trees, being harmless to the tree. (See remedy for scale insects.)

FOR APHIS UPON PLUM AND PRUNE TREES.

Caustic soda (98 per cent).....	1 pound.
Rosin.....	6 pounds.
Water.....	40 gallons.

Directions.—Prepare as directed in rosin wash for winter use.

FOR APHIS ON ROSE BUSHES.

Spray with strong tobacco water, but must be washed off in about thirty minutes after being applied, with cold water, or dust with buhach.

FOR BLACK SMUT ON ROSES.

Use equal parts of pulverized sulphur and air-slacked lime, dusted on the foliage.

FOR SCALES ON FLOWERING SHRUBS OR GARDEN PLANTS.

Whale-oil soap (80 per cent).....	$\frac{1}{2}$ pound.
Water.....	1 gallon.

Directions.—Dissolve soap by boiling, and apply at a temperature of 100 to 120 degrees Fahrenheit.

FOR TOMATO AND VINE MOTHS.

The best remedy for the destruction of these caterpillars is hand-picking. The plants should be looked over from time to time, and all larvæ found destroyed. The tomato caterpillars feed upon the plants voraciously, and in a very short time strip them of their leaves. The caterpillars are so large, and as they consume considerable foliage, their damaging effects are soon observed on the vines; however, it is rarely that more than one or two caterpillars are seen upon a vine, so they are easily exterminated.

Those attacking grapevines are destroyed by cutting them in two with pruning shears, thus avoiding handling them. The best way to check the increase of these moths is to destroy all caterpillars as they are found. Where the larva becomes troublesome it is well to examine the trees or plants every day, and in this way the damage becomes nominal.

FOR THE TWIG BORER, POLYCAON.

The best remedy so far is to hunt for the infested branches, and to run a wire into the hole, and after working it around several times it will kill the beetle. The hole is then plugged up with wet clay, or soap.

If the branch does not break down by its weight it will heal over in time; but if the limb shows signs of withering, it is best to cut it off.

Spraying with Paris green—one pound to one hundred and sixty gallons of water—at a time when the Paris green cannot affect the foliage or fruit, tends to decrease their numbers; but if the larva enters the bark it is then free from any poisoning, and must then either be killed or the affected limb cut off.

FOR PEACH MOTH OR TWIG BORER.

The only remedy so far has been to remove the infected branches when found and burn them, but this seems to me impracticable. The summer remedies applied for the pernicious scale have also destroyed the larvæ of this moth, and it has thus been prevented from doing much harm.

FOR STEM BORERS.

The best remedy to prevent borers from infesting trees is to carefully guard the tree from scorching or sunburn. For this purpose a shade, three feet long, split in two and placed on the south and west sides of the tree, answers the case well; wrapping with sacks or paper is also useful. A coating of whitewash, containing some soap and sulphur, is more preferable.

FOR UNDERGROUND BORERS.

If a tree has been only slightly attacked, so that half or two thirds of the bark can be saved, it will pay to take care of it. If it goes further than this, a tree will never become thoroughly sound, and will be outstripped in growth by young trees planted later. Remove the earth at the base of the tree and wrap up the trunk with stout paraffine paper, and pile up against the paper air-slacked lime or ashes.

Whenever a borer is removed, the debris and dead wood should be entirely cleaned out and a smooth surface left, taking care to preserve the bark as much as possible. Then the wound should be smeared over with grafting wax and a rag tied about it. In this manner young trees have been saved.

It is very difficult to ascertain the presence of underground borers before the trees indicate their presence. Walnut and apple trees sometimes are observed to be bleeding (oozing sap) from a certain spot; this indicates a borer, or having been damaged otherwise. However, the cause should be carefully looked into by cutting into the bark and the borer destroyed. The wound should then be covered over with such material that will prevent the action of the atmosphere from injuring the tree.

FOR SHOT-HOLE FUNGUS.

It is only quite recently that any extensive experiments have been made to suppress this malady. Many growers have felt the attacks of this fungus but slightly, owing to late spraying in the spring of the year with the lime, salt, and sulphur remedy, as well as with other solutions into which fungicides have been added, such as sulphide of copper, sulphide of iron, hyposulphide of soda, sulphur, etc. In adding these ingredients the greatest care should be exercised that none such

be added that will be destroyed by the action of the chemicals contained in the solution to which they are added, as in such instances it cannot be expected that any great benefits can be accomplished by their use.

To secure good results the remedy should be applied just as soon as the buds begin to swell, and which must be followed by the application of fungicide solutions of a weaker kind during the growing period of the tree. The remedy should be applied immediately upon the appearance of the fungus, which is first detected upon the young fruit and the developed leaves.

FOR PEAR CRACKING AND LEAF BLIGHT.

Where the disease prevails more or less every year, it would be well to thoroughly spray the trees, before the buds begin to swell, with the Bordeaux mixture, prepared as follows:

Dissolve sixteen pounds of sulphate of copper in twenty-two gallons of water; in another vessel slack thirty pounds of lime in six gallons of water. When the latter mixture has cooled, pour it slowly into the copper solution, care being taken to mix the solutions by constant stirring.

When the leaves are about two-thirds grown a second application should be made; this time, however, using a solution containing the ingredients in the following proportions:

Sulphate of copper	6 pounds.
Lime	6 pounds.
Water	22 gallons.

Dissolve the copper in sixteen gallons of water and slack the lime in six gallons of water; then mix as described above.

The object of the first spraying is to destroy any spores of the fungi that may have survived the winter in the crevices of the bark, while the second and weaker application is obviously for the purpose of preventing such spores as may fall upon the young leaves from germinating. It would be well to repeat the application of the weaker solution every three or four weeks until the last of July or the middle of August.

The following summer remedy is used with the aim of destroying the scale upon the trees, as well as checking the progress of the fungi:

Sulphur	3 pounds.
Caustic soda (98 per cent)	2 pounds.
Whale-oil soap	25 pounds.
Solution (in all)	100 gallons.

Boil the sulphur and caustic soda together in about two gallons of water (this is done to allow the caustic soda to dissolve the sulphur). When the sulphur becomes dissolved, add the soap, and boil until thoroughly dissolved; then add water to make in all one hundred gallons of solution, and apply warm.

CHAPTER III. BENEFICIAL INSECTS.

The insects that prey or feed upon those that injure fruit and fruit trees, plants, etc., are properly termed "beneficial." The natural fecundity of the destructive insects is so great that they could not be destroyed without their aid. Fruit growers have imported many kinds of trees for experimental purposes and otherwise, and unfortunately upon them came many insects, which developed and proved hard to exterminate, and while many effective remedies have been invented, yet they have been taxed with the heavy burden of repeating the operation no less than once a year. The cottony cushion scale once had a great run in this State, infesting citrus orchards, but its attacks were not alone confined to that class of trees, but it also attacked nearly every variety of ornamental plants, shrubs, etc.

In many cases the cost of fighting the insect with the remedies at hand was greater than the value of the production of the orchards. I remember when several orchardists offered to pay \$10,000 to any one who would invent a remedy that would exterminate the insect by one application. A reward of \$1,000 was also offered by a county, and every "tree doctor" came to compete for the prize. This not only brought out the manufacture of "cure alls," but it also agitated the minds of the scientific class, and chemists experimented almost daily with all sorts of poisons that could be applied to trees, but all this without avail. The Board held Conventions of fruit growers in various parts of the State, and these matters naturally came up for discussion. It was contended by some that as the insect came from Australia, possibly there were remedies in use there which were keeping it in check, as from all advices received the citrus trees there were not suffering from its attacks like those in this State. But our correspondents said that remedies were but little known. This, of course, appeared to the growers here as very strange, and the members concluded that there must be parasites keeping it in check. The matter of importing the parasites that might there be found was then agitated, and at our State Convention held at Riverside in April, 1887, a resolution was adopted asking Congress to appropriate a sufficient amount of money to defray the expenses of an agent to be sent by the Department of Agriculture. The efforts made by our Representatives in this direction failed, no doubt because the matter was so little understood by the members of Congress. Prof. W. M. Maskell, an entomologist of Wellington, New Zealand, in a letter under date of March 5, 1887 (Report State Board of Horticulture, 1885-86, p. 393), says: "Now, as to natural enemies. So far as our experience goes, *Icerya purchasi* has none in this country. The only coccids which I have found attacked by parasites here are some lecanids (chiefly of the genus *Tenochton*), one or two diaspids, and a dactylopius. Birds do not eat *Icerya*, and in fact we have nothing here to check its increase to my knowledge."

This letter was written previous to the Riverside meeting, and the letter of inquiry at least three months prior thereto, as were other letters of the same tenor. The Department of Agriculture was helpless in the matter of sending an agent abroad, there being a restricting clause in the law with regard to foreign travel, and confining all investigations to America. This question, however, was kept constantly agitated, and memorials were adopted at the various Fruit Growers' Conventions held throughout the State.

Hon. Frank McCoppin, of San Francisco, was appealed to for aid, he having been appointed a Commissioner to represent the country at the Exposition at Melbourne, Australia, in 1888. Mr. McCoppin promptly responded to the request, and succeeded in laying aside sufficient funds to defray the expenses of an agent. Albert Koebele, of Alameda, was delegated on said mission, and it was he who discovered the *Vedalia*, the results of which the public are well aware. Then it is to Mr. McCoppin and the Department of Agriculture that we owe a debt of gratitude, and especially to Mr. McCoppin, for having provided the necessary funds through which the discovery was made, for without his financial aid probably the *Vedalia* would have remained unknown, except in entomological cabinets.

Stimulated by the wonderful results of the *Vedalia*'s labors, we applied to our State Legislature for an appropriation to search for other beneficial insects that may be found in the countries where many of the baneful insects among us abound. The Legislature at the session of 1891 passed an Act appropriating \$5,000, to be used by the State Board of Horticulture for such purpose. The Board applied to the Secretary of Agriculture at Washington to delegate Albert Koebele on said mission, and requested that his salary be met by the department, the Board assuming to pay all the expenses.

Having learned that Hon. J. M. Rusk, Secretary of Agriculture, had accompanied President Harrison on his trip to the Pacific Coast, I left for Los Angeles to meet him, and present our application to him in person. After an hour's consultation he agreed that this was a question of vital importance, and also said he considered it of national importance, and promised to consider the matter on his return to Washington.

This he did, as shown by the following letter:

UNITED STATES DEPARTMENT OF AGRICULTURE,
WASHINGTON, D. C., May 29, 1891.

Mr. B. M. LELONG, Secretary State Board of Horticulture, 220 Sutter Street, San Francisco, Cal.:

SIR: I have taken steps to arrange for Mr. Koebele's mission for Australia and the adjacent islands, under the direction of this department, all of his expenses to be paid by your Board. Will you please arrange with him so as to secure the prompt payment of said expenses. His salary will be paid by this department as usual.

Respectfully yours,

J. M. RUSK,
Secretary.

Mr. Koebele sailed on the steamer "Alameda," August 20th, for Australia. Since his arrival there he has sent several consignments of different kinds of beneficial insects and parasites, which are now being colonized. Mr. Koebele reports having met with great success in discovering predaceous insects, and says that the *Orcus chalybeus* will prove equally as valuable as the *Vedalia*, and preys on the red scale, and says he will not return to America until it is introduced. He also

discovered several others, which he thinks will keep the pernicious, apricot, and black scales in check. Another very important discovery he made is of a ladybird that preys on the woolly aphis. Now that these insects have been discovered, it will be an easy matter to introduce them here, as new lots will be sent from time to time until they are thoroughly colonized.

There can be no doubt but that in course of time the fruit growers will be able to overcome most every insect pest by means of its natural enemies.

LADYBIRDS INTRODUCED.

Orcus australasiæ, Boisd.

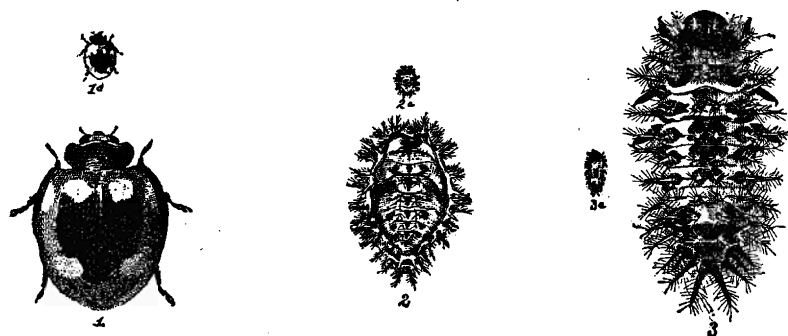


Fig. 1.

1. *Orcus australasiæ*, Boisd. (magnified); 1a. Natural size. 2. Pupa enveloped in larval skin; 2a. Natural size. 3. Larva; 3a. Natural size.

Halysia galbula, Muls.



Fig. 2.

1. *Halysia galbula*, Muls. (magnified); 1a. Natural size.

Verania frenata, Er.

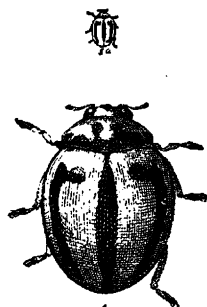


Fig. 3.

1. *Verania frenata*, Er. (magnified); 1a. Natural size.

Orcus chalybeus, Boisd.



Fig. 4.

1. *Orcus chalybeus*, Boisd., female (magnified); 2. Head and prothorax of male; 1a. Natural size.

Leis conformis, Boisd.

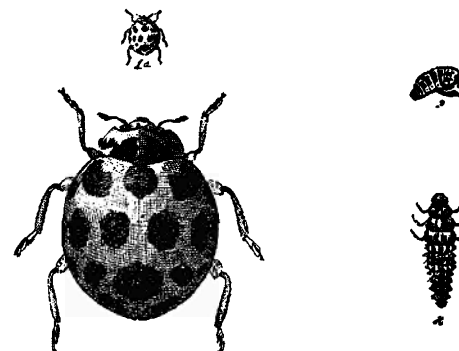


Fig. 5.

1. *Leis conformis*, Boisd. (magnified); 1a. Natural size. 2. Larva, natural size. 3. Pupa, natural size.

The following very interesting account of these species, by A. Sidney Olliff, Government Entomologist of New South Wales, is taken from the "Agricultural Gazette" (Vol. II, Part II, pp. 63-66), to which journal I am indebted for the same, and for the illustrations herewith reproduced:

"About Sydney we have quite a large number of species of *Coccinellidæ*, and among the commonest and most useful are the beautiful steel-blue species known as *Orcus australasiæ*, Boisd., and *Orcus chalybeus*, Boisd., and the orange-yellow and black-spotted *Leis conformis*, Boisd. A number of the larvæ of *Orcus australasiæ* were found by me in December last, preying upon the young of the red scale (*Aspidiotus aurantii*), a coccid insect which has been doing serious damage to oranges and lemons in the neighborhood of Sydney during the past few years. Subsequently these larvæ were reared to the perfect state in the entomological laboratory of the Department of Agriculture, where they bred freely and produced a large number of eggs. These were deposited in patches of from thirty to fifty, on the under sides of leaves. They were oval in shape, yellow in color, and attached to the surface of the leaf at their broadest end. The full-grown larva fed with avidity on the green aphis

of the apple (*Aphis mali*), and on red scale, devouring an enormous number daily. In form it is elongate, slightly narrowed behind, and provided with six rows of fleshy spines, which are covered with rather long setæ, or hairs, extending from behind the head to the posterior extremity; of these, two are dorsal—one on each side of an impressed median line; one is situated near the margin on each side, and the others are lateral; the lateral rows are much longer and somewhat stouter than the others. In color the larva is black, with a whitish median line extending throughout its length, and there is a narrow whitish line on the first three abdominal segments on each side of the middle; the fleshy spines on the thoracic segments, and on the fourth, fifth, and sixth abdominal segments, are pale, dusky yellow; the others black; at the anal extremity are four long, black spines. The coloring is somewhat variable, particularly as regards the prevalence of the white, but in all the specimens which have come under my observation black, or rich purplish black, is the prevailing hue. In length the larva measures from six to eight millimeters, or more than a quarter of an English inch. Before changing to the pupa, my specimens exuded a viscous and adhesive fluid, by means of which each larva attached itself firmly by the tail to a stem or leaf, the point of attachment being apparently just before the extremity of the abdomen; and when this was done, the larva gradually contracted in length, and increased in girth. In less than fifteen hours the creature had completed the change, and the pupa was found incased in the skin of the larva, which inclosed it as if in a swaddling-cloth, except that it was split down the middle. The pupa is reddish yellow in color, with three rows of rather large black spots on the dorsal surface, and measures from four to five millimeters in length. It remained in this state from eight to twelve days, and then the perfect insect—a brilliant steel-blue beetle with bright red spots—made its appearance. Another equally common and useful species is *Leis conformis*, which preys unceasingly on the orange aphid (*Siphonophora citrifolii*) and the American, or woolly blight (*Schizoneura lanigera*). The larva of this species is not furnished with hairy spines, like the *Orcus*, but is provided with small fleshy projections on the lateral margins. The pupa is attached to the leaf or stem by the tail, and the larval skin usually remains around the tail, but does not develop the pupa, as described above. When bred in confinement, the larval skin is sometimes thrown aside altogether, and, for all that is known, this may also occur in a state of nature. *Orcus chalybeus*, a small, bright, steel-blue species, is also an effective enemy of various scale insects that affect the fruit grower. I have myself seen the perfect insect on the camphor laurel, sucking the juices of young scale insects; and it is sometimes extremely abundant in orange orchards near Sydney. The male of this species may be distinguished from the female by having the sides of the prothorax yellow in color. *Halyzia galbula*, Muls., performs a useful work farther north, and *Verania* (*Coccinella*) *frenata*, Er. [I am indebted to the kindness of the Rev. T. Blackburn for this name, and also for checking the identification of the *Orci* mentioned in this article], and a large number of other species carry on the war against aphid and plant-louse wherever they occur. Many of these ladybirds pass the winter in the perfect or adult state, hiding under bark, in crevices, among dry leaves, or any other suitable place, and on the approach of spring are ready to emerge from their resting places and begin the war anew. In cold climates

they frequently make their way into the house for shelter, and if left undisturbed will hang in clusters on the ceiling until their period of hibernation is passed.

"Of all the friendly insects none are more useful than the *Coccinellidæ*, or true ladybirds. Throughout the spring and summer they wage constant war, both in the adult and larval or young state, against the scale insects and aphides which live at the expense of our fruits and crops; and so great is their activity in destroying these pests in seasons when the aphides and scales are unusually abundant, that it may be said the cultivator owes a large part of the crop he gathers to their unaided efforts. Their voracity in the early or larval stages is really astonishing, each insect devouring an enormous number of young scales or aphides before attaining maturity. John Curtis observed that two ladybirds cleared two geraniums of aphides in twenty-four hours, and he describes the curious and skillful way in which a common English variety attacks its prey. ('Farm Insects,' p. 72. London, 1859.) One of the aphides, it seems, was seen struggling with a ladybird larva, when the latter, fearing that the aphid might escape, gradually made its way along to the wings, which were closed, and immediately began to bite them, so that in a very short time they were rendered useless, being matted together. It then seized the thorax, and, without more ado, ate into the side of its victim. The ferocity with which they attack the insects upon which they feed is characteristic of the whole group, and has been referred to by many writers; and, curiously enough, the smaller species of the family are perhaps even more fierce than their larger brethren. In alluding to this fact, Dr. T. W. Harris, one of the earliest workers in the field of economic entomology, quaintly says: 'There are some ladybirds, of a very small size and blackish color, sparingly clothed with short hairs, and sometimes with a yellow spot at the end of the wing-covers, whose young are clothed with short tufts or flakes of the most delicate white down. These insects belong to the genus *Scymnus*, which means a lion's whelp, and they well merit such a name, for their young, in proportion to their size, are as sanguinary and ferocious as the most savage beasts of prey. I have often seen one of these little tufted animals preying upon plant-lice, catching and devouring with the greatest ease lice nearly as large as its own body, one after another, in rapid succession, without apparently satiating its hunger or diminishing its activity.' ('Treatise on Some of the Insects Injurious to Vegetation.' New edition, p. 247. New York, 1890.)

"The number of ladybirds in any particular season is ordinarily proportionate to that of their victims, but after a season when the aphides and scale insects have been unusually abundant, the ladybirds make their appearance in great numbers. Sometimes, indeed, they appear in vast swarms, evidently in search of some locality where there is plenty of their food; and on such occasions it is no very uncommon thing for the crops upon which they may settle to have a bright yellow or scarlet hue, owing to the presence of thousands of these insects. In the hop-growing districts of the south of England these swarms occasionally occur, and I have myself seen them in such numbers that they had to be swept from the pathways about the houses. In seasons of scarcity, women and children collect the ladybirds in certain parts of Kent and Surrey and sell them to the hop grower, who afterwards sets them free, a practical application of one of nature's benefits, which, as far as I am

aware, is almost unique in the history of economic entomology, but one, nevertheless, that has prevailed for many years, if not for centuries. The true ladybirds are small, hemispherical, or strongly convex insects, belonging to the order *Coleoptera*, or beetles, generally red, yellow, or blue in color, and ornamented with round, or lunate spots. They are always flat beneath, and, as a rule, if the ground color is blue, the markings are red. The head is deeply immersed in the prothorax, which is more or less emarginate, or cut out in front. The antennæ are usually eleven-jointed, short, and retractile, with a more or less distinct three-jointed club. The prothorax short, transverse, with the flanks frequently concave for the reception of the antennal club. The elytra or wing-cases cover the body, and are usually glabrous, never punctate-striate or truncate behind. The legs are short, contractile, with the front tibiæ sometimes toothed, the tarsi three-jointed, first and second joints dilated, spongy beneath, the latter large and bilobed, claws appendiculate or cleft, rarely simple. More than a thousand species are known from various parts of the world, and of these many are difficult to discriminate on account of the extraordinary variability in their coloration and markings. About fifty species, representing about a dozen very nearly related genera, are known at present in Australia, and doubtless a considerable number still remain to be recorded. After pairing, the ladybird lays its eggs in patches on the stems, or beneath the leaves of a plant where plenty of aphides or scale insects are to be found, frequently placing them in the midst of a cluster of plant-lice, as if to save the young larvæ the trouble of searching for food when they first hatch. The eggs are small, oval, generally pale yellow or reddish yellow in color, and are affixed to the stem or leaf in an upright position. The patches are composed of from twenty to a hundred eggs, the number varying with different species, and apparently to some extent in the same species at different seasons of the year. The larvæ vary considerably in form, particularly in the armature of the segments, but they are always long, oval, soft-bodied creatures, with the prothorax larger than the other segments, and the body narrowing towards the hinder extremity. They are often gaily colored, and are frequently armed with tubercles, setiform appendages, or spines. The head is small, generally rounded in front, and provided on each side with three or four simple eyes or ocelli. The antennæ inserted at the anterior angle of the head is formed of three joints, of which the first is short, the second cylindrical, very long, the third extremely small, pointed. The jaws are triangular, pointed at extremity, bifid, with minute teeth at their base. The thoracic segments (those bearing the legs) differ but little from those of the body or abdomen. Nine pairs of breathing orifices or stigmata, the first situated on the side of the mesothorax, the eight others on the first eight abdominal segments; the latter are nine in number, as is usual in insect larvæ, and present below a very pointed anal opening, and a fleshy prominence used in progression. In some of the smaller species of ladybird larvæ, as in the genus *Scymnus*, for example, the body presents little cavities, disposed much in the same way as the spinous appendages of the other forms. When fully matured, and about to change to the pupal state, the larva attaches itself at the extremity of the body to a stem or leaf, and either throws off the larval skin in the act of changing, retaining it merely at its point of attachment to the tail, or the old skin is retained, loosely encasing the pupa and thus forming a protection to the animal.

In the former case the dried larval skin remains about the tail of the pupa."

NEW SPECIES.

(Discovered in California.)

Exochomus marginipennis, Le Conte (Fig. 18, Plate IV).—Found feeding upon young pernicious scale in Santa Clara County. Ground color shining black; head yellowish red; thorax with yellow margin, center black, widening on hind margin. Elytræ sub-convex, shining black, with minute red spot near the center, and a large marginal spot joining the hind margin of thorax. Abdominal segments black, legs reddish brown, pubescent.

Anatis subvittata, Mulsant (Fig. 17, Plate IV).—Found feeding on woolly aphids in Humboldt County. Ground color brownish yellow, or clay color. Head with central area black. Prothorax sub-oval, transverse; side margins broadly whitish luteous, with the whole central area black; wider on the hind margin. Elytræ brownish luteous, with two whitish spots at the base, one on either side of the scutellum, and surrounded by a black ground which forms part of the figure of its elytral ornamentation, which is that of three vittæ connected together and unequal in length and width, and rudely representing a figure 5 on each elytra. Abdominal segments brownish black; legs black. Length, .33 of an inch.

AN ENEMY TO THE BLACK SCALE.

Thalpocares coccophaga, Meyr.

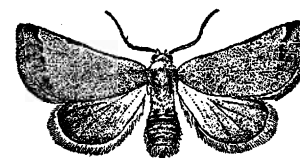


Fig. 6.

The larva of this moth has kept the black scale in check wherever it has been found in Australia and New Zealand, and limbs sent with cocoons of this moth were thickly covered with old scale that had been eaten out by the larva. This moth was discovered about Toowoomba and Brisbane several years ago, and Mr. Koebele, on his former mission, sent several consignments of this valuable insect, but they fell into the hands of an agent who rather more delights in seeing insects pinned in his cabinet than in an orchard destroying myriads of scale, and he killed all that came and put the dead specimens in his collection. Thus the fruit growers were deprived of the benefits resulting therefrom. It is to be hoped that no more insects of this kind will be killed, but instead, be placed where they may have a chance of increasing, with the hope that they may become colonized, and in time keep the black scale

in check. Mr. Koebele has wisely sent collections of this moth to several parties here, and it is to be hoped that they will live and become permanently established. The following account of this moth is given by Henry Tryon, Assistant Curator of the Queensland Museum, in Report No. 1, on Insect and Fungous Pests, p. 126, 1889:

"*Thalpocares coccophaga*, Meyr.—Both at Toowoomba and Brisbane we have noticed amongst these black scales, and generally in the angles formed by the branches on which they feed, what are usually described by gardeners in both districts as 'extra fine specimens' of the pest. Examination, however, of these will soon reveal the fact that they are lepidopterous grubs, which have clothed themselves with a dark covering, and that this is interwoven with and covered by the black remains of dead Lecanidæ. Thus ensconced these grubs do from time to time consume the scale insects, and we have seen a tree almost stripped of the latter by their agency."

"This caterpillar changes into its chrysalis state in or near the position where it was first found. After a certain number of days from the chrysalis there emerges a small moth having these characteristics: It is rather small, having an expanse of wings measuring from nine to ten lines. The fore wings are elongate-triangular, with the anterior border slightly concave, the apex round-pointed, and the hind margin strongly rounded and oblique. The head is pale yellowish brown colored, the body and limbs gray, irrorated with white. The hind wings are brownish (fuscous) gray, with yellowish white bases. The fringe of the fore wings is fuscous-red, that of the hind wings is gray, and in both cases tipped with white."

THE FLY-PARASITE OF THE PLAGUE-LOCUST.

Before grasshoppers appear again the chances are that fruit growers will be better prepared to combat them. In parts of Australia for years a fly, a species of *Tachina*, has attacked the hoppers and locust, and in a short time lessening their numbers, so much so as to prevent them from doing much damage to trees and crops. It is the natural enemy of the pestiferous hopper, feeding on them as voraciously as the hopper does on vegetation. Our Entomologist, Mr. Craw, sent for some of these predatory insects last summer, but this was not the proper time of the year to secure specimens for breeding. Now that Mr. Koebele is abroad in search of parasites, etc., he has been especially requested to secure the parasite for propagation in this State. A. Sidney Olliff, Government Entomologist of New South Wales ("Agricultural Gazette," Vol. II, May, 1891, pp. 255-57), gives the following interesting account of the parasite and its work:

"Owing to the kindness of several correspondents who have been at the trouble of forwarding a number of living plague-locusts, or grasshoppers (*Pachytylus australis*, Br.), to the entomological laboratory of the Department of Agriculture, I have had an opportunity of breeding the dipterous parasite, which for a good many years past has been known to assist in keeping that pest in check. In December last Mr. J. P. Buggy referred to the existence of small grubs at Corowa, living at the expense of the locust; and subsequently he forwarded a fly which had been bred from one of these grubs, together with the information that early in February fully 60 or 70 per cent of the grasshoppers were

affected with these parasites. From an examination of a number of locusts forwarded from Corowa by Mr. A. H. Bray, I ascertained that the grub, or larva, is found within the locust, where it appears to live upon the adipose tissues of its victim, avoiding the vital parts with unerring instinct. The grub lives indifferently in the thoracic region or the abdomen of the locust, and frequently three or four may be found in a single grasshopper.



Fig. 7.

Adult Plague-locust with dipterous larva, as yet unbred, emerging from behind metathorax; natural size.

"The grubs leave their victims when they are full grown, usually by means of an opening which they eat in the side of the locust at the point where the abdomen joins the metathorax; but they do not invariably make their exit from the body of the unwilling host at that particular place, as on one occasion I observed two grubs escaping from a grasshopper at the same time—one from between the first and second abdominal segments, and the other from between the head and prothorax. As soon as the grub makes its escape, the grasshopper, which has gradually grown more and more feeble as the inclosed parasite has gained in size, dies. In several instances I have observed that the grasshopper died before its enemy succeeded in making its escape; and in one case a larva was seen vainly struggling to free itself from between the metathorax and abdomen of a dead grasshopper, where it was firmly held by the contracting remains of its victim. The grub, which subsequently died without extricating itself, succeeded in freeing more than half its body, but it was firmly held by the tail.

"Grasshoppers containing parasitical grubs, captured by Mr. Bray on January 22d (received by me two days later), began to show signs of feebleness on January 25th, and on the following day several of the larvæ made their appearance. On January 27th these larvæ, having



Fig. 8.

A. Puparium of *Masicera pachytyli* (magnified). A1. Same (natural size).

buried themselves at a depth of three quarters of an inch in the earth at the bottom of the breeding cage in which the grasshoppers were confined, were found to have changed to the pupal state; and five or six days later, on February 1st and 2d, the perfect flies made their appearance. This fly proved to belong to the family *Tachinidæ*, as suggested in a previous number of this 'Gazette.' The full-grown larva measured 7 mm. in length, and is yellowish white in color. It has the segments much constricted, and no distinct head. The mouth parts are very obscure,

and the material at my disposal is not sufficient for a satisfactory examination of them; but the head is provided with two spine-like processes, which appear to correspond to the maxillæ. The two spiracles on the

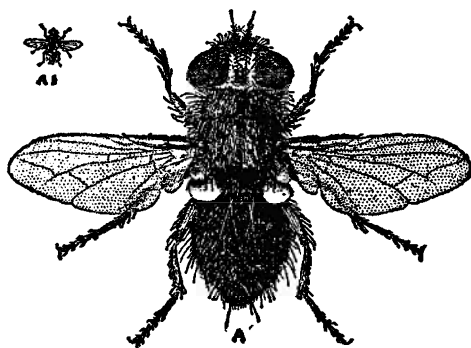
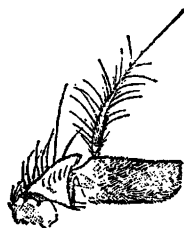


Fig. 9.

A. *Tachina* fly (*Masicera pachytyli*, Sk.), a parasite of the plague-locust (magnified).
A1. Same (natural size).

A-2
Fig. 10.

Antennæ of *Masicera pachytyli*.

last segment are very conspicuous. The pupa is elongate, ovate, chestnut-brown in color, and measures 5 mm. in length. As long ago as 1873 this fly was known as a parasite of the plague-locust, and I find that in that year Sir Frederick McCoy referred specimens submitted to him by the Victorian Department of Agriculture to the genus *Tachina*, but up to this time no definite account of the insect has been published, so far as I am aware. Under these circumstances I thought it desirable to refer the specimens bred by me to Mr. F. A. A. Skuse, who has made a special study of the diptera, and he has been kind enough to furnish me with the following description of the species:

"*Masicera pachytyli*, Skuse, sp. n.—*Male*: Long, 2; alar, 1½ lines. Yellowish gray, with black bristles and hairs. Antennæ: third joint twice the length of the second, angular above and rounded beneath at the apex; sixth joint stout towards the base and plumose on its basal half, one third longer than the third; black, the two basal joints brown. Eyes deep purplish brown, naked. Head gray, with a dusky stripe on the front, extending to the base of the antennæ. Thorax with three very narrow, parallel, tolerably distinct, dusky stripes; metanotum blackish; abdomen short, about the length of the thorax, arched, obtusely oval, more or less distinctly tinged with blackish. Legs sordid fulvous-brown; the tarsi black or blackish. Wings hyaline, somewhat grayish; first posterior cell narrowly open (closed by the costal vein); costal vein terminating before the apex of the wing; the distance between the tips of the second and third longitudinal veins considerably longer than that between the tip of the latter and the apex of the wing; elbow of the third longitudinal vein incurved at the base with a stump of a vein; great cross-vein obliquely situated, very slightly longer than, and at a right angle with, the last section of the fourth longitudinal vein, which reaches the margin; small cross-vein obliquely situated opposite the tip of the first longitudinal vein.

"*Female*: Long, 3; alar, 2½ lines. Differs principally in being larger, blacker, with the legs entirely black.

"*Obs.*—Evidently a new species, belonging to the genus *Masicera*, to which genus it is, at any rate, provisionally ascribed.

"Mr. J. R. Garland found this same fly in great abundance at Wagga Wagga in January, and Mr. G. V. Rahn met with it at Germantown. I found a second and much larger dipterous larva in each consignment of locusts, which appears to differ materially from the other species. One of these specimens unfortunately died before reaching maturity, but a second, evidently belonging to the same species, is still alive, and

I hope to observe its transformations. The accompanying figure will give some idea of its form.

"At present I shall refrain from speculating as to its affinities; but I shall be glad to receive living locusts affected with either of these parasites, as I am anxious to work out their life history in detail."



Fig. 11.

A. Larva of dipterous fly, not yet bred, parasitic on the plague-locust (magnified).
A1. Same (natural size).

YELLOW SCALE PARASITE.

(*Coccophagus citrinus*.)

For a number of years the principal orange groves of San Gabriel were infested by a scale of the genus *Aspidiotus*, which did considerable damage to both fruit and foliage. It kept on spreading every year, and remedies did not seem to check its progress. In the spring of 1889 our attention was called to the general decrease of this scale, and a request having been made upon the Board to have the cause of such decrease looked into, Mr. Alexander Craw, the Entomologist, was detailed to make an examination. He did so, and in Bulletin No. 57 are his conclusions upon the same. Since the publication of said bulletin, however, it has been considerably commented upon, and has been characterized as premature; that is, the cause of the decrease of scale has been attributed to other causes, such as excessive rainfall, disease among scales (what absurdity), and others.

We received a letter from a County Board of Horticultural Commissioners saying that the bulletin had done them a lot of harm, that people could not be made to spray their trees where any of these parasites were found, and greatly feared that their services would no longer be required. Another Commission, from a county where the parasite has not yet appeared, wrote, urging further investigations, and said: "Do not be discouraged in your work; the field of investigation and advancement is wide open before you, and will be for generations to come."

The Yuba County Board of Horticultural Commissioners, in their report to the Supervisors, said: "A parasite that preys on the yellow scale (the kind that infests Marysville trees) has been recommended by the State Board of Horticulture for importation as a check to the advance of the scale. Our Commission has investigated the work of this fly in Southern California orange groves, and have concluded that it has not done the work attributed to it, and therefore is not entitled to the prominence given it by the State Board."

Personally, I do not know the extent of the investigations claimed, but I am reliably informed that it was only a one-day casual inspection by one of its members in a few orchards. I am also informed (by one of the members) that the report was made without the sanction of the other members of the Board. To arrive at such conclusions of a microscopical insect as this is, and so minute that the aid of the best and

most powerful instruments is necessary to determine its work, requires the trained eye of an expert, and many months of constant investigation and study.

It would perhaps be best to not notice such ridiculous statements, but as they were given wide circulation under the guise of "Horticultural Commission," I addressed the following communication to prominent growers of San Gabriel, and whom I know are competent to deal with the subject:

OCTOBER 6, 1891.

DEAR SIR: You are no doubt aware of the injury done by the yellow scale throughout the San Gabriel Valley for a number of years, and its decrease in the past few years. It was to determine the cause of this decrease, and the bright fruit sent out from the San Gabriel Valley, that Mr. Alexander Crow, the Entomologist, was detailed to make an examination. His conclusions were published in Bulletin No. 57, of which I inclose a copy. Mr. Crow attributed the cleanliness of the fruit, and also the healthy appearance of all orchards in the San Gabriel Valley, to an internal parasite, which he described in said bulletin. Since that time his report has been commented upon as premature, and the results attributed to various other causes; but it will be noted that those who have criticised his report were not acquainted with the facts. I therefore beg of you to give us your experience with regard to same.

I desire such facts as I may obtain from you and others that will establish the real cause of the decrease of scale, and increase of bright fruit and healthy orchards throughout the valley.

Their answers are entitled to the greatest consideration, and I accordingly give them in full, as follows:

LOS ANGELES, CAL., October 9, 1891.

B. M. LELONG, Esq., 220 Sutter Street, San Francisco:

DEAR SIR: Yours of the 6th instant to hand, with inclosed Bulletin No. 57. There is no doubt of the correctness of the conclusions arrived at by Mr. Crow in regard to the value of the parasite working on the yellow scale in the San Gabriel Valley. I have not as yet personally examined any orchards outside the Duarte district, but the reports from other districts confirm what I have noted there. The yellow scale has decreased within the last two years at least 75 per cent. The orchards that have been sprayed are in much worse condition than others that have been left alone. In general, the trees are in better condition and have a finer crop than they have had since the scale first attacked them. No doubt the more generous use of fertilizers and better cultivation has much to do with this, but there is no doubt but that the parasite has done the most towards putting them in the fine condition they now are. I do not expect that we shall ever be entirely free from the scale, but I am convinced that with proper cultivation and the assistance of the parasite we shall be enabled to keep the pest in such control as to be practically harmless.

Yours truly,

JOHN SCOTT,
County Horticultural Commissioner.

LOS ANGELES, CAL., October 10, 1891.

B. M. LELONG, Esq., Secretary State Board of Horticulture:

DEAR SIR: Your communication of October 6th, asking for my experience with what is commonly known as the "yellow scale," is at hand, and in reply thereto I beg to state that the yellow scale first made its appearance in my orchard at San Gabriel in the fall of 1883. From that time on until the fall of 1887 I sprayed continuously with all of the substances in common use for such purposes, but without making any headway against the pest. In the fall of 1887 I concluded to abandon the spraying and see what the result would be. I received my first colony of Vredalia, the white scale parasite, on April 16, 1888, and while its efficacy as an eradicator of the white scale was then undoubtedly established, I took but little interest in its introduction, because I felt that with it removed I still had an unconquerable foe in the yellow scale. The white scale, as you well know, vanished before the inroads of the Vredalia, and while some portions of my orchard looked worse from the effect of the yellow scale during the summer and fall of 1888, other portions visibly improved. On July 31st, with Colonel Dobbins, of San Gabriel, and Professor Coquillett, I visited A. B. Chapman's orange grove, and also the Cogswell grove at Sierra Madre. In both of these orchards we found the *Coccophagus citrinus* in large quantities, and found the trees generally improving.

After visiting the groves above mentioned we then went to my place, and, while there, Professor Coquillett found one of the yellow scale parasites. From that time on I could find them scattered here and there throughout the orchard, and during that fall and spring I carried large quantities of them from A. B. Chapman's and Colonel Dobbins'

orange groves, placing them in my trees, adhering to branches brought from their places.

In the summer of 1889, in addition to the parasite above mentioned, I discovered on my place a bug differing to some extent from the *Coccophagus citrinus*, which was undoubtedly doing the same work as the true yellow scale parasite. Mr. Alexander Crow examined the bug, and for the time being called it the "Golden Chalcid." It is larger than the other parasite, and of a bright, golden yellow color. This parasite is much more numerous to-day in my orchard than the other is. Ever since the summer of 1888 the yellow scale has been rapidly disappearing from my place, and those trees that were at that date very badly infected are now almost entirely free from the pest. I lost but little fruit out of six thousand boxes last year on account of the yellow scale, and from present appearances will not lose any the coming season. There is not the slightest doubt in my mind that the improvement is entirely due to the presence of the parasite above named. I know there are people who sneer at this parasite, and who try to attribute the improvement to other causes; but any one with a strong glass can watch the workings of the insect and satisfy himself that they are the true destroyers of the yellow scale.

I have determined never again to start a spray pump under any circumstances in my orchard, because I feel satisfied that the true way to fight these pests is by their natural enemies. I think that the experience of all the orange growers in the San Gabriel Valley is similar to mine, and that they will all attribute the disappearance of the yellow scale to the parasites which we know are there working upon them.

Very truly,

J. A. GRAVES.

SAN GABRIEL, LOS ANGELES COUNTY, October 10, 1891.

Mr. B. M. LELONG, Secretary State Board of Horticulture, San Francisco:

DEAR SIR: Your letter of October 6th duly received, wherein you ask to what the decrease of the yellow scale is attributed, and further, if we agree with the report of Mr. Alexander Crow, in Bulletin No. 57.

We have watched the decrease of the yellow scale, and the working of the chalcid fly upon it, and attribute the decrease, and in many places, the total extinction, solely to the workings of its internal parasite, the chalcid fly, wherein we fully agree with Mr. Crow in his report known as Bulletin No. 57.

J. R. DOBBINS.
A. S. CHAPMAN.

KINNELOA, LAMANDA PARK, October 14, 1891.

In answer to your question about the yellow scale, I can say that my orchard, formerly badly infested, is now free. We have found the parasite that Mr. Crow speaks of destroying the scale. I know of no other cause for its disappearance. In my opinion the yellow scale parasite bears the same relation to that scale that the Vredalia does to the white scale.

I consider Mr. Crow a careful investigator and an honest thinker. I place great confidence in his statements. In the case of the yellow scale I know of nothing to confute his views.

Yours very truly,

ABBOT KINNEY.

The parasite is very small, .03 of an inch, and its benefits as a scale destroyer cannot be determined in a day's investigation; neither can any one determine its inefficiency by a casual inspection with the naked eye, nor can its increase be noted until it has had time to multiply. Thus to some, as in this instance, must appear that it is other causes that are diminishing the scale, because they cannot see the operation; that is, the parasite devour the scale in the manner the Vredalia does, or as large animals, such as the coyote, devour a lamb. Sometimes it may be well to advance theories, but to condemn on theory is a dangerous practice and should not be tolerated.

A letter from Prof. D. W. Coquillett was published in the "California Fruit Grower," September 21, 1889, concerning this parasite, as follows:

LOS ANGELES, September 11, 1889.

Editor "California Fruit Grower:"

Concerning the parasite of the red scale in the San Gabriel Valley, Acting Entomologist Howard writes me that it is probably a new species belonging to the genus *Coccophagus*. It is a minute, four-winged fly, scarcely as large as the head of a small pin; its eggs are laid singly in or upon the scales, and the larva or grub that hatches from this egg feeds upon the scale insect, and after completing its growth and passing through its preparatory stage it gnaws a round hole through the scale and thus makes its escape. This parasite occurs in nearly all of the orange groves in the San Gabriel Valley, and in some of them its work is very noticeable. This is especially the case in the large Chapman groves, in which I detected this parasite two years ago. During a visit to this grove a few days ago it was almost impossible to find any young red scales on the infected trees, while in other localities where this parasite does not occur, almost every leaf contains one or more of young scales, this being the season of the year when they are most abundant. Mr. A. B. Chapman informs me that there is less red scale on his fruit this year than there has been since first his trees became so seriously infected with these pests. I have taken the necessary steps for introducing this parasite into a locality where it did not previously exist, but it will be several months yet before the result of this experiment can be determined.

CHAPTER IV.

APPLE ROOTS RESISTANT TO WOOLLY APHIS.

In September of last year, 1890, I received the following letter from Mr. John C. Blackmore, of the "Pah Gardens," Onehunga, Auckland, New Zealand, concerning apple roots resistant to woolly aphis, or, as they are called in the Colonies, "blight-proof stocks." Mr. Blackmore says:

"In your report I notice on page 214, and in your reports of Horticultural Commissioners, the remarks on woolly aphis. I infer from these remarks that the fruit growers of California are not acquainted with the method pursued in this country to combat this great enemy to the successful culture of the apple.

"In hope that it may be of use, I send you a short history of the troubles we had to contend with in cultivating the apple in this country, until the fortunate discovery that Winter Majetin and Northern Spy apples were blight-proof. Prior to 1870 the apple tree had, for many years, been the victim of the woolly aphis in its most virulent form. Apple trees presented a most heart-rending spectacle, the trees being gnarled and knobbed from rootlet to branchlet from the abundance of the aphides. Indeed, many varieties, even with the most rigid attention, could not be kept alive. The result was that the apple well nigh went out of cultivation, and we depended upon our supply of fruit from Tasmania. Things were in this State when Mr. Thomas Lang, of Victoria, informed us that the Winter Majetin apple really did set the aphides (*S. lanigera*) at defiance, and that, in conjunction with a Mr. Treen, he was carrying out a series of experiments to test the aphis-resisting qualities of Winter Majetin and other kinds. Further tests proved that the Northern Spy possessed the same valuable resisting qualities as Majetin. The apple tree then became a matter of special study by a few cultivators, both in this part of New Zealand and in Victoria. Seeing the perfect immunity from blight which these two varieties enjoyed, both branches and roots, it at once suggested itself that if these two varieties were used as a stock to work all other kinds on, it would defy the attacks of the aphis below ground.

"About sixteen years have elapsed since I first drew public attention, through the Australian press, to the above apples as blight-resistant, and as a stock to work other kinds on, and they have stood every test, remaining entirely blight-proof. When those kinds most subject to blight were grafted on them, all below the graft have proved to be clean. It was in the roots below ground, where the aphis multiplies during autumn and harbors during winter, that formerly gave us trouble, but by grafting on Majetin and Spy all affected apples it dislodges this pest from the roots, and the cleansing of the branches of varieties very much subject to blight, and worked on them, is comparatively an easy matter where there is no harbor for the insects below ground; in fact,

varieties formerly very much subject to blight on the branches before working on blight-proof stocks, are since almost free, therefore the great obstacle to successful apple culture is removed. This was very forcibly brought to my mind a short time since, when acting as judge of fruit at the Auckland Horticultural Show. Ten years previous, when acting in the same capacity, there were only about twenty dishes of apples, but



Apple branch affected by woolly aphid. A. The cottony masses under which the insects are. B. The insects (natural size).

on the occasion I now refer to there were four long rows of tables running the whole length of the drill-shed, devoted to apples. The first table contained one thousand dishes of apples for competition—not an inferior specimen among the lot. The other tables were likewise crowded from

end to end, among them collections containing over three hundred distinct varieties, and all perfect specimens fit to compete with the best grown in any part of the world. Truly, we can say of the apple aphid, it is no longer a pest.

"In grafting on these stocks, to insure the cion not taking root, the cion or bud should be inserted one foot from the ground; all varieties form a perfect union on either stock. Northern Spy forms a mass of small fibrous roots close to the main stem. Winter Majetin roots are not so numerous, and travel a long distance in search of nutriment.

"For some time after the discovery of Majetin and Spy being blight-proof, the stock of each kind was very scarce; the ordinary propagation was too slow a process. The method I finally adopted was to side-graft, inverted, a piece of any kind of apple root, in an oblique cut, on a Majetin or Spy cutting two inches from its base. The cuttings emitted roots of their own below the inserted root; the following autumn the plants are lifted, and the piece of root that was grafted on is cut clean out, leaving, of course, the young plants now on their own roots. The method now pursued, and which was first practiced by myself on a large scale, is to propagate both Spy and Majetin by their own roots, as root cuttings, in planting the roots leaving the smallest trace only above the surface. These root cuttings make fine trees, and are fit to regraft the following spring. We also graft Majetin cions on its own roots, likewise Northern Spy, and sometimes work Majetin cions on Spy roots, or Spy cions on Majetin roots. It seems to make but little difference either way; they are blight-proof stocks, and all varieties worked on them do well.

"Our climate produces a good stock, propagated as above, fit for regrafting the following spring.

"You can further experiment with New England Pigeon, Striped Beaufin, Gravenstein, Duchess of Oldenburg, and Irish Peach. They are seldom affected with aphid; Irish Peach never.

"Any information you further desire I shall be happy to forward, and that you may experiment with these blight-proof apples, true to name, I will forward you twelve small trees of each on their own roots, free of all charge, by the next steamer."

In a subsequent letter, Mr. Blackmore writes:

"By steamship 'Alameda,' I send to you, in charge of Messrs. J. H. & Alfred Gunner, a small package containing Winter Majetin and Northern Spy apples on their own roots; also cions of a few varieties seldom affected with blight (woolly aphid), for experimental purposes, as advised in former letter. I intended sending much stronger plants, but through sickness I was unable to pack them myself, but had to request a respected friend of mine, W. J. Palmer, nurseryman, to do so for me. As two friends of his, Messrs. Gunner Bros., were proceeding direct to San Francisco, they offered to take charge and deliver at your office a small package; and so as not to inconvenience them with a bulky package, small plants have been sent. To insure their being free from disease or insect pests, I instructed Mr. Palmer to wash both cuttings and plants before packing. I shall be pleased to send again if these fail in transit, or trees, seeds, or cuttings of anything from here of use to you.

"Perfection and Lord Wolseley are valuable late kinds, the former an Australian seedling, the latter of New Zealand. The varieties of apples in the hands of growers about Auckland are very numerous, one

grower alone having introduced eight hundred varieties. The varieties of pears and plums, excepting prunes, are numerous; of peaches, a few years since there were no better varieties obtainable anywhere. Enormous crops were produced until a disease made its appearance, the nature of which is not yet known; and the large groves belonging to the natives, and those planted later on by the settlers, have died out, and a plentiful crop of peaches is a thing of the past, although there are several good kinds which have not been lost. I do not recommend their introduction into California, for fear of introducing the disease with them."

The small parcel of cuttings duly arrived, and were donated to the Agricultural Department of the State University for growth and subsequent distribution. The material was not in very promising condition.

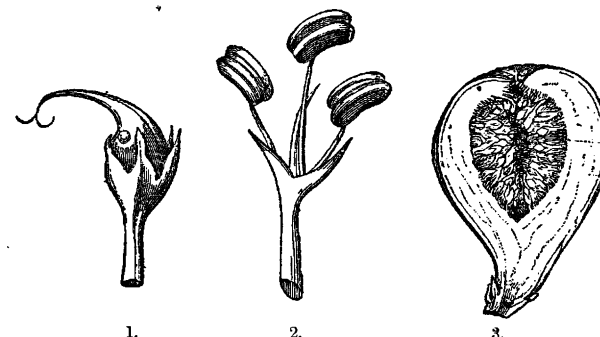
Of course, the inference that California fruit growers do not know of the existence of varieties resisting the woolly aphis is not correct. At least ten years ago the late John Lewelling announced at a meeting of the State Horticultural Society that he had found that trees grown from seeds of Rawle's Janet and the Golden Russet were little injured by woolly aphis. The resistance of the Northern Spy has also been known, but that variety is unsatisfactory in most parts of California, and has been but little planted; consequently few have had opportunity to observe its resistance. John Rock has experimented for several years with resistant stocks, and so have others, and the fact that this is a promising direction for experiment was urged years ago. But for all this fruit growers have never done much in commercial propagation in this line, and the facts stated by Mr. Blackmore should attract much attention.

CHAPTER V. THE BLASTOPHAGA.

FIG CAPRIFICATION, OR THE SETTING OF THE FRUIT.

"Thus we see that the flowers, which we vainly think are
'born to blush unseen,
And waste their fragrance on the desert air,'

Though unvisited by the Lord of Creation, who boasts that they were made for him, have, nevertheless, myriads of insect visitants and admirers, which, though they pilfer their sweets, contribute to their fertility."



1. A pistillate flower of the fig; enlarged.
2. A staminate flower of the fig; enlarged.
3. Longitudinal section of the fig, showing the fruits inclosed by the fleshy receptacle.

The question of fig caprification has been the all-absorbing topic of the day among the fig growers in this State, and especially since the introduction of the fig wasp (*Blastophaga psenes*) from Asia Minor, by means of which insect it was hoped that the fertilization of the Smyrna fig could be successfully accomplished.

I listened with much interest to the lecture on the Blastophaga by Gustav Eisen, before the Academy of Sciences, at San Francisco, August 3, 1891, and expressed the fondest hopes of it demonstrating that caprification is an absolute necessity. I procured various specimens of Smyrna figs, from early spring to late fall, and carefully examined the eye, or blossom end, and could find no opening, nor even a possibility, for any insect to enter the fig. I so reported what my conclusions were at that time, and further stated that while these investigations were still in progress I did not wish to speak dogmatically, but I had so far found what seemed to me evidence that in some cases, at least of the Smyrna fig, the fruit was found to have gone beyond the point of fertilization of the interior inflorescence before there was any opening whatever in the eye, or blossom end of the fig. Even in figs quite small I found the seed formation so far progressed that the seed

had a well-defined shell, and at that time I believe the time for fertilization had passed. Mr. Shinn disputed some specimens I exhibited as not being the Smyrna, and brought me several of his Smyrna, or so called "Bulletin" figs. I carefully examined them, and also compared them with the specimens I had procured from different places, and called Mr. Shinn's attention to the fact of their being much closer, or tighter, at the blossom end than mine. Mr. Shinn could not account for this, and said, in reply, jokingly, "The insect will get in; they know their business."

The following I quote from my own report of the year 1889, page 136, to show the stand I have taken on the question; and my conclusions are not theories, but are based upon the reports and investigations of modern scientific writers, viz.:

"In the fig the organs of fructification are hidden from view; therefore we cannot tell exactly when fertilization is effected, but it is supposed that it takes place when the eye assumes a pinkish hue, and expands and admits a little air into the interior, where the flowers are.

"In many parts of Italy and the south of Europe, in olden times, cultivators paid much attention to setting the figs by the method of caprification. This practice was much believed in, but is condemned by most modern scientific writers as absurd.

"Caprification, according to the experience of practical growers, is altogether a delusion; and many of the largest plantations of the Old World have continued to bear fruit without the aid of the caprifig.

"Professor Gasparrini, a learned botanist, carried on very extended experiments, covering a period of six years, and in an essay written for the Royal Academy of Sciences of Naples, detailed the number of experiments which he had made and repeated in different years. Their results lead to the conclusion that caprification is useless for the setting and ripening of the fruit, and that instead of making the figs remain on the tree, it either causes or facilitates their fall, especially when the insect had penetrated into the inside, and produced decay by its own death. When the insect entered a fig, the maturity of it was hastened, as apples and pears are when attacked by a grub. Professor Gasparrini recommended the abolishment of the practice, as it only entails expense, and deteriorates the flavor of the fig.

"In the islands of the Archipelago the practice has been abandoned, according to the French naturalist Olivier, but in which islands excellent figs are produced.

"The process, stripped of all its mystification, is a simple one, which, as stated before, has proved a delusion, and is only alluded to here as such. In the first place, there is a wild species of fig, called 'caprifig,' on which it is said a certain insect exists, which enters the fruit when in a young state, at the eye, thereby facilitating the entrance of light and air, or some fertilizing vapor, whereby the flowers are enabled to set and ripen. In fig plantations numbers of this wild species are planted for the sole purpose of bearing these insects; and at the proper season the fruits, with the insects, are carried and deposited on the fruit or shoots of the domestic species."

I am by no means a disbeliever of the process; but for the time being, and until the merits of the Blastophaga are proved beyond a doubt, I shall weigh with much consideration the conclusions of the authorities I have quoted, and further, because I have but recently made a very

important discovery which gives me new grounds for such a belief, which I will explain further on.

BLASTOPHAGA (PSENES) GROSSORUM, GRAV.

(*Cynips psenes*, Linn.)

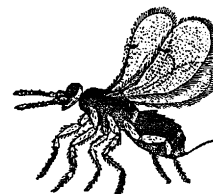


Fig. 4.
Male—Magnified.

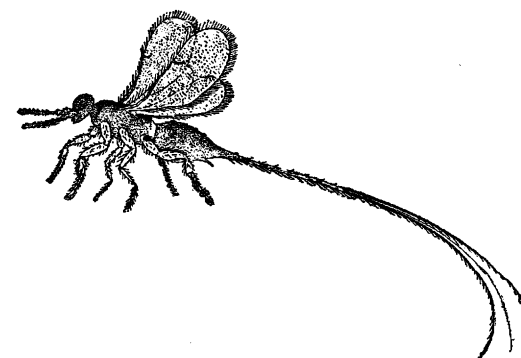


Fig. 5.
Female—Magnified.

Description.—Female: Average length, .08 of an inch. Wing expanse, about .11 of an inch. Color light brown. Antennae clavate, ten-jointed, covered with fine hairs. Head sub-globose. Eyes very large and prominent, of a dark color. Thorax long. Abdomen elongate acute, terminating in a long, hairy ovipositor, three times the length of the body, two thirds of the terminal portion of which is divided into three parts. On the under side of the abdomen is a process. Wings transparent, pubescent, with long marginal hairs. The stigma of the anterior wing at right angle from marginal costa. The legs are of the same color as body, and covered with stout hairs. The tibia of the front legs is stouter than that of the second pair. The posterior legs are much stouter and longer than the others.

Male: Length, about .07 of an inch. Wing expanse, about .11 of an inch. Color black. Antennae clavate, eleven-jointed, hairy. The scape is much larger than that of the female. Head same as female. Eyes dark and prominent. Thorax about as long as abdomen. Abdomen obtuse, with a short curved stylus. Wings and legs same as those of female.

The credit of the introduction of this insect into the State belongs solely to Mr. James Shinn, of Niles, and as to how it came about, I cannot do better than give Mr Shinn's own statement, viz.:

"We wrote to some friends that were known to us in Smyrna; or rather some missionaries were stopping at my house, and seeing that my figs did not bear, and that I was getting uneasy about it, one of the ladies—my wife's sister—said she knew a lady from Syracuse, New York, who was then in Smyrna, and if she would write to her she would fix up a few of the fig cuttings and send them. The lady sent for them, and instead of sending a half dozen cuttings, sent a whole box of cuttings, on which I paid about \$100. After I received this box here comes another little box, and a letter saying: 'The figs must be caprifigged, if not

you will get no figs. I sent you a little box of figs that are full of the Blastophaga, and hope you can do well with them.' The moment we got them my son went out to the caprifig tree, opened the box and set it out there. Some of the insects were dead, and some were alive. I saw Mr. Eisen the next day, and told him about the Blastophaga and the figs. He and Mr. Maslin came to my place the Sunday following, July 26th. We examined and found some live insects, but most of them were dead. The Smyrna figs that were caprifigged, that is, that had the pollen put in artificially, came to perfection, but no others did. Two crops have all gone to the ground, and are now on the ground, except about ten figs. The pollen that was injected into the figs was from the caprifigs grown on my place at Niles. There are two varieties of the Smyrna fig. One has a three-lobed leaf, and the figs small and elongated. The other is a five-lobed leaf, and the figs are flat and roundish."

ARTIFICIALLY CAPRIFIED FIGS.

Mr. Shinn then exhibited three figs which were caprifigged by means of a quill toothpick*—two roundish and one elongated. In answer to a question as to the openings of the figs at the time they were fertilized, Mr. Shinn could not remember, but said: "The insect knows how to get in if it must; that is a provision of nature. Only the figs that were caprifigged have come to perfection; the others all dropped off."

QUESTION: Were those figs caprifigged by the insect, or artificially?

MR. SHINN: Artificially.

Q. Then there is no fig that has come to maturity known to have been caprifigged by the insect?

MR. SHINN: None at all.

Mr. Maslin, who was present, was requested to state his views and observations, which he did, as follows: "On July 26th I went over with Mr. Eisen, at his invitation, to examine the Blastophaga. We met Mr. Shinn's son, who pointed out to us a fig tree which he said was a caprifig, and one of the importation made by the San Francisco 'Bulletin' Company. The others in the rows belonged to the edible fig. We found in the boughs of that caprifig tree the box containing the caprifigs imported by Mr. Shinn, with quite a large number of dead Blastophaga. Mr. Eisen cut open the dried caprifigs, and found them literally black with the insects, which began to move, but very sluggishly. The size of the insect is about one line—one twelfth of an inch. We then took some of those insects and scattered them at the so called blossom end of some of the caprifigs and some of the figs known as the 'Bulletin's' importation. Mr. Eisen then proceeded to fertilize some of the figs. We found that the fallen caprifigs from the growing tree on the ground were full of pollen. Cutting them open, Mr. Eisen dusted the pollen about the open end of various figs. I suggested to him that we should insert the pollen by means of a toothpick. I picked up a fig and dusted the pollen into my hand, filling the toothpick with the pollen; and he inserted the toothpick into several figs. We pollenated several figs with the pollen of the caprifig; then went around at the end of the row and proceeded down toward the south and pollenated, probably, twenty figs in several places, selecting such figs as showed growth. We then

*This operation was first conceived of by George C. Roeding, of Fresno, and thus matured Smyrna figs in 1890, and also in 1891.



Fig. 5.

FIGS GROWN AND EXHIBITED BY MR. SHINN.

1. The large Smyrna, flesh amber color. 2. The small Smyrna, flesh dark red.

tied a string at each place below the fig that was pollenated, so as to find them afterward."

QUESTION: Mr. Eisen claims to have inserted a quill into an edible fig, and when he withdrew it that there were Blastophaga at the end of the quill. He so stated in his lecture on the Blastophaga.

MR. MASLIN: I recollect that on a tree next to the caprifig there was a Blastophaga; but I doubt the correctness of the statement, because we were not looking for any insect in the fig, and you don't generally find something you are not looking for. We were not looking for insects.

Q. How large were the figs you operated on?

MR. MASLIN: About one and one half inches long and one and one fourth inches thick.

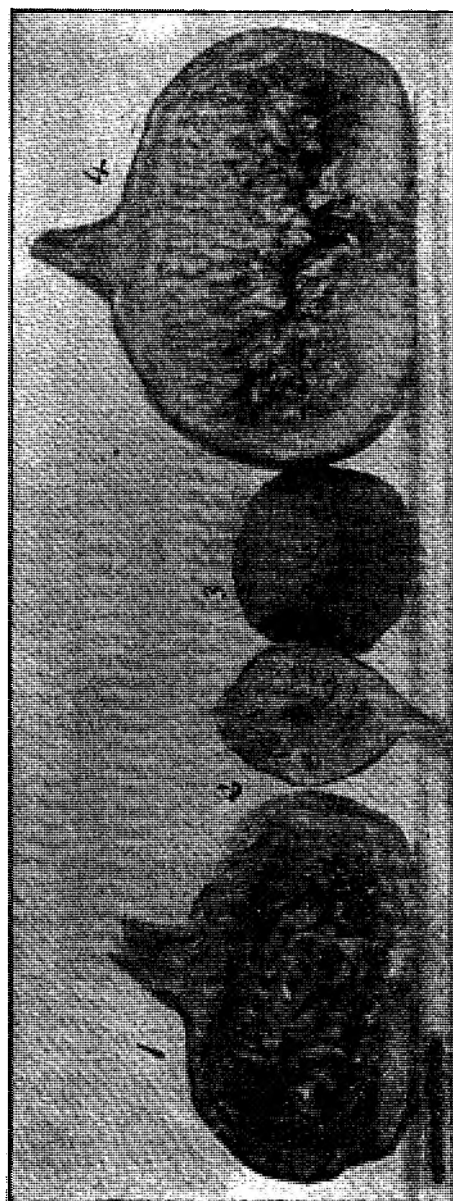


Fig. 7.

FIGS SHOWING THE MATURED FRUIT IN THE RECEPTACLE.

- 1, 4. Sections of Smyrna figs artificially caprifigged, showing the cavity made by the insertion of the quill toothpick with which the pollen of the caprifigs was inserted.
- 2, 3. Small or immature figs, showing the female flowers in the receptacle, and the size the mature figs were at the time the pollen was inserted; also, the closeness of the blossom, or eye, of the fig at the time fertilization is said to take place.

Q. How were the openings of the figs at that time?

MR. MASLIN: To the eye they were not open; closed as tight as tight could be.

Q. In your opinion, was it possible for an insect to get in?

MR. MASLIN: That I could not say; but I was particular because I am interested in that question. I particularly looked to see if I could find a fig where the insect was in; but I declare I *never* saw a fig where

it seemed possible for an insect to enter. When I took a bottle of these Blastophaga to my ranch, and went over the ten acres, I found only two figs with a hole big enough to put an insect in, and I put the insects into these, but the figs have fallen off.

Q. Was the pollen used taken from California-grown figs or from the imported?

MR. MASLIN: From caprifigs grown by Mr. Shinn. I have ten acres of Smyrna seedlings. I sowed the seed in 1885 and 1886. The first crop this year the fruit on the limbs was very thick, as on plum and prune. The figs this year, of that crop on the trees that were grown from seed, are big, but had no saccharine matter in them, and dried right up. About two weeks ago I found two dozen little figs on current wood, being so called second crop. They were of a lovely cream, ivory color. The meat was amber color and very sweet, but not filling the receptacle. It only showed that there was some saccharine principle being developed.

AN IMPORTANT DISCOVERY.

The ground for argument by those who believe in caprification has been that no fertile seeds had been found in any California-grown fig. Also, that all figs, and especially the Smyrna, only contain female flowers; and the fact of fruit of trees imported from Smyrna not com-

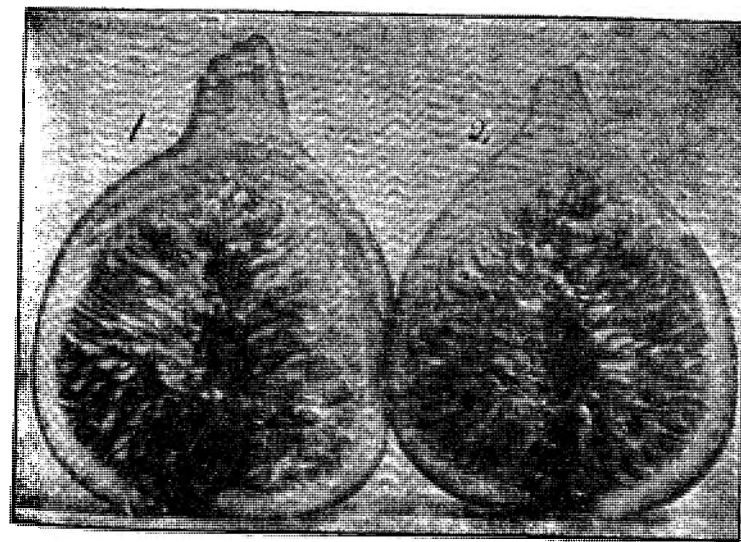


Fig. 8.

CALIFORNIA-GROWN FIGS WITH FERTILE SEEDS.

1. Specimen showing mature fruits. 2. Specimen showing how the fruits lie in the receptacle; the male flowers are towards the blossom end.

ing to perfection, gave them stronger grounds for such belief; that is, the pollen of the male, or caprifig, had to come in contact with the flowers of the female fig to produce fruit. Also, that the reason of not having found kernels in the seeds of California-grown figs was attributed to the lack of the pollen fertilization.

On October 20, 1891, while visiting an orchard at Los Gatos, I came across a tree which attracted my attention, by reason of it being of peculiar foliage; and upon cutting the fruit, I found that it possessed both pistillate (the female organ of a phænogam, consisting of the ovary with its stylus and stigma) and staminate (the pollen-bearing organ of the flower, consisting of an anther usually supported upon a stalk or filament) flowers, which were so grouped that the pollen from one was freely conveyed to the other. Thus fertilized the female blossoms had developed into hundreds of perfect seeds with well-defined kernels.

This is the first time that fruit of this character has been found in this State, that is, containing both pistillate and staminate flowers, and the seeds perfect kernels. One of the specimens cut in the presence of E. W. Maslin, Secretary State Board of Trade, and G. F. Weeks, Agricultural Editor of the San Francisco "Chronicle," was full of pollen; in fact, the pollen was so abundant that it gave the center of the fig a yellow appearance. Unfortunately the figs were not fully matured, so there was no opportunity to test their quality. On cutting them open they were of a decidedly purple hue near the skin, changing to bright red and to deep red in riper specimens. Hardly any red coloration was visible in greener specimens, the entire flesh being a deep purple. The fig is of elongated shape, rather small, and resembles the elongated fig grown by Mr. Shinn, both in shape and color of flesh. It has a leaf resembling the Smyrna, finely lobed.

Since the above was prepared Mr. Maslin brought to my office (November 9th) several seedling Smyrna figs grown by him in Placer County. The specimens were small, of a bright amber color, and the fruits in the receptacle well developed and ripe. Upon examination they were found to contain numerous male flowers and considerable pollen. We have here two conclusive facts showing that the insect is not altogether essential for the setting of the fruit, in some figs at least.

This is a progressive world, and its people, step by step, have unraveled many of the most difficult problems, so let us hope that wisdom and ingenuity will in the near future solve this interesting question.

The question of caprification, which at present is attracting so much attention, has been most ably expounded by Professor Gasparrini, referred to elsewhere, and the following is a translation from the Italian, of his essay:

ON THE CAPRIFICATION OF THE FIG.

[The Royal Academy of Sciences of Naples proposed as the subject of an essay:

1. To examine the opinions of authors on caprification, above all, those of Cavolina and Gallesio, and to see what were the merits of the ideas and experiments of these men.

2. To describe the varieties of figs, especially those on which caprification is practiced.

3. To prove by experiment, or on anatomical or physiological grounds, whether the fertilization of the seeds is affected by the insect of the caprifig, or whether the insect produces no such effect and caprification be useless.

4. The essay to be accompanied by figures representing the varieties of fig on which the experiments are made, and the structure of their organs of fecundation and fructification.

Gasparrini's memoir in reply is divided into four parts. The first contains a detailed physiological account of the caprifig and its different varieties, which he considers not only specifically but generically distinct from the cultivated fig, including a detailed history of the fly bred in its fruits.

The second is a similar account of eatable figs cultivated about Naples.

The third (here translated) relates specially to caprification.

The fourth is a botanical comparison of the fig, the caprifig, and some exotic species.—B. M. L.]

1. *Historical Notes on the Subject.*—Herodotus informs us in his histories that the Babylonians knew of old that there were male and female date trees, and that the female required the concurrence of the male to become fertile. This fact was also known to the Egyptians, to the Phœnicians, and to other nations of Asia and Africa. The ancients were acquainted, moreover, with several circumstances proved by experience relative to the diversity of sexes in plants, like the one just mentioned of the date tree, and among these dioecious plants they distinguished the female as being the one that bore fruit. And in other cases where they suspected a diversity of sexes, not having any fixed rule or sufficient science to guide them, they judged merely by external *facies*, by medicinal virtues, or by other such fallacious or slight indications. If it may not indeed at all times have been universally believed that all things endowed with senses or life are reproduced by the concurrence of sexes, yet the ancients, although they could not detect either the sexual organs of plants or the fact of their fecundation, nevertheless seeing them at certain periods of their life clothed with elegant flowers, perfumed with various essences, distilling delicious nectars, all radiant with glory, as if prepared for some ceremony of proportionate importance, they judged by the rules of common sense and analogy that this was the period of their loves, and that there must be amongst them all, according to the laws of nature, a male and a female. Thus, with regard to the date tree, the Babylonians, either imagining or finding by experience that the great distance of the male was often an impediment to the fecundity of the female, they suspended to the latter male flowers brought from a distance; and they believed that the fertilizing power of these male flowers resided in the small flies which they harbored, and which, introducing themselves into the female flowers, caused them to set and to ripen. This operation, called *palmification*, is still in use, and reckoned necessary for obtaining fruit in the country where the date tree grows naturally. If we could establish with certainty that this theory of the date tree was current before the facts were known concerning the fig, we might well suppose that the earliest Greek cultivators, seeing the caprifig always sterile (in so far as that the fruit does not become sweet), with a coarse and wild habit, and seeing the quantity of little flies it produces, should have thought that that was indeed the male, and that the fertility of the real fig depended upon it, and that thus taking example from the date tree the custom should have originated of suspending the flowers of the caprifig to the domestic fig tree. But the memory of this custom is even more ancient than that of the palmification of the date tree. This *caprification*, as it is called by us, is spoken of by the most ancient Greek writers on natural history; it is alluded to by Aristotle, and minutely described by Theophrastus, writers

who were not only superior to all others in their philosophical speculations, but were very ingenious in their ideas on natural objects and phenomena.

Aristotle observes that a certain insect is generated in the flowers of the caprifig, which, having become a fly, enters the unripe fruits of the domestic fig and causes them to set, for which reason cultivators always plant the one by the side of the other, or suspend the fruits of the one to the branches of the other. Theophrastus does not confine himself to this bare statement of the practice which prevailed, but discourses at length on the manner in which the little fly could produce this effect, whether by opening or by closing the aperture of the fig. He rejects the second theory and pronounces for the first, saying that the fly by continual nibbling enlarges the mouth of the fig and sucks out the superfluous humors, and that the air penetrating through the aperture, it follows that by its warmth and fermenting qualities the fig sets and ripens. Nevertheless there are races of domestic figs which do not require the aid of the caprifig to ripen, and treating of these, this diligent observer is of opinion that this may arise from the quality of the soil or of climate as well as from the particular nature of certain figs which can ripen their fruits without assistance. He believes that a poor dry soil with a northern aspect, the deficiency of moisture in such soil, the cool wind which is usual in such a situation, and even the dust which would cover the fruit and absorb its superfluous humors, would all tend to open the mouth of the fig and produce the same effects which in the other case are brought about by the flies, and that if in Italy and some other countries caprification was not known, it was because, for the above reasons, the figs in those countries set and ripened naturally; and Pliny, speaking of this subject, says that the caprifig is of a wild nature, and does not ripen its fruit, but that it imparts to the fig that virtue which it does not itself possess, for such is the course of nature, that even from putrefaction something should be generated. It produces midges, which, deprived of any nourishment from their own parent, fly to the allied fig, and by continual biting at the mouth enlarge it, and, penetrating within, facilitate the admission of light and fertilizing air (*aura cerealis*), thus transforming the milky humor into a sweet honeyed juice. On this account the caprifig should be planted near the fig, and on that side from whence the wind might carry the fertilizing breath. Now, this description is but little more than a copy of what Theophrastus had written so long before. These were the opinions of the learned as well as the usages of the country in the times of Herodotus, Aristotle, Theophrastus, Dioscorides, and Pliny; but however ancient was the practice in Greece, it remained there; for there is no tradition of its having been introduced into Syria or Palestine; and Pliny remarks that even at his time it was only in use in the islands of the Archipelago. It may, therefore, be affirmed with tolerable certainty that it was only brought from thence into our country (Italy), although, owing to the long rule of barbarians, it is impossible to fix the period of its introduction with any degree of probability.

After the revival of science, Cæsalpinus, about the year 1583, discovered the sexual organs in flowering plants, and thus the conjectures of the ancients became a certainty. Nevertheless, the opinions on the effects of caprification did not change in the least, and none of the botanists or agriculturists of the time, who treated of the fig, differed

in this respect from Theophrastus, as may be seen in the works of Bauhin, who lived many years after Cæsalpinus. In the beginning of the last century, Tournefort, traveling through Greece, endeavored to ascertain the details and the effects of caprification, and whatever he saw and noted down he afterwards published. He follows the opinion of the Greeks with regard to the manner in which the effects may be produced, saying that the caprifig produces three kinds of receptacles (as we have elsewhere explained in detail) and three generations of the fly in the course of the year; that there are eatable figs which require the assistance of the caprifig to set; that the virtue of caprification consists in the bite of the insect, which, by enabling the superfluous milky juice to escape, causes the fig to set and ripen, and perhaps also some liquid issuing from the fly itself produces the saccharine fermentation by combination with the juice of the fig. Pontedera afterwards, in making known the structure of the flowers, as well of the caprifig as of the fig, states his belief that the fly acts upon the latter by giving admission into it to light and air. All which statements differ in little or nothing from the opinions of the Greeks.

Meanwhile the discovery of Cæsalpinus, in the commencement of the preceding century, had more than ever attracted the attention of the learned, many of whom admitted the necessity of sexes for the fecundation of fruits, and especially for the purpose of obtaining fertile seeds, yet there were not wanting those who contradicted it, and amongst other grounds adduced the fig as ripening its fruit without fecundation. But the most sensible observers multiplied the facts relating to the fecundation of vegetables; they ascertained that the female date was enabled to set and ripen its fruit, not by the insect, as Herodotus believed, but by the fertilizing powder of the anthers; and, amongst other remarkable circumstances, this also was discovered, that certain animals and vegetables lived under a kind of mutual dependence for the accomplishment of the operation. Thus, for example, it was observed that the male flowers of the gourd abounded in pollen, which is their fertilizing powder. With this pollen bees chiefly form their wax, and the bee flying from flower to flower carries it from the male to the female flower, which eagerly sucks it up, becomes fertile, and grows into the fruit. These facts and other similar ones having been related and proved, it appeared to the learned, and especially to Linnæus, that they explained the whole secret of caprification. This great botanist well knew that the fruit is the enlarged ovary, and that the fig commonly called a fruit is not the ovary, but a receptacle containing the flowers, and capable of enlarging without the assistance of fecundation. Knowing, moreover, by the researches of Pontedera, that the domestic fig only contained female flowers, and that the males were in the caprifig, and that in the one, as in the other, the flowers remained inclosed within the receptacle, he conceived the beautiful idea that the fecundation of the fig took place by a special provision of nature. This consisted in the creation in the caprifig of an insect which, for the purposes of support and propagation, was obliged to penetrate into the domestic fig, and carried with it the prolific humors. Thus fertilized the embryo was produced, and the greatest number of the receptacles remained on the trees, and came to maturity. In reply to those who followed the opinion of Camerarius, who said that the seeds of the fig never germinated, as well as to those who alleged on the contrary that fig trees

could be only raised from the seeds of figs of the Greek Archipelago, or of Italy, with the remark that the statement of Camerarius was correct in regard to seeds produced in Germany, France, or England, where, there being no caprifig, the figs remained necessarily sterile, whilst, on the contrary, in Greece and Italy, where the caprifig existed, the fig seeds became fertile, either naturally or artificially, by means of caprification, this explanation appeared so just and natural that it was generally adopted.

2. *Concise Exposition of the Theory of Cavolini.*—Towards the close of the last century, Cavolini, who was in natural sciences the pride and ornament, not only of Naples, but even of the whole of Italy, sent to press a learned treatise on the present subject. He first describes the caprifig and the fig; then observes that they are but individuals of one species, the caprifig being androgynous and the fig the female plant; and he proceeds to endeavor to prove the necessity of caprification. The fig, he says, is a receptacle, or "a portion of the branch prolonged for the purpose of fructification, and not a pericarp, which is the external covering of the seed. The receptacle can support itself and attain its perfection without fecundation; but not so the pericarp, on account of its adherence to the seed by means of its vessels." Nevertheless, he afterwards declares that this theory is not in all cases confirmed by fact, alleging that the receptacle of the strawberry, of the mulberry, of the blackberry, and of other plants, does not grow or become succulent till after the fecundation of the pistil. And from these data he argues, as to the mode in which caprification works, as follows: That which is commonly called the fruit, is a dilatation of the branch and bears the flowers; but being different from the real branch in internal structure, the nutritive fluids meet with difficulties in passing from the large direct channels of the branch into the vessels of the receptacle, which are of a different structure and direction. On this account they would soon drop off if the female flowers were not fertilized; but as the fecundation induces an affluence of humors to the ovary, and thence to the receptacle, it follows that the one and the other continue to grow. And as this defective structure is greater or less in different sorts of figs, so (extrinsic) fecundation is necessary in some, superfluous in others, whilst others only require a very little of it. And if the same fig at Naples, for example, may require caprification, and not require it at Capri, it is because in the latter place the soil, reduced to the finest dust, and the air loaded, the one with alkaline salts, the other with phlogistin, could produce the same effect; that is, the setting and ripening of a large quantity of fruits. Thus it is that in certain places caprification is entirely unknown, as in the promontory of Sorrentum, Ischia, and other districts. Believing, therefore, that fecundation was necessary to sustain the domestic fig till its maturity, and that it contained only female flowers, whilst those of the caprifig were androgynous, with perfect anthers, it followed naturally that the fly coming from one to enter the other should carry with it the pollen or the fertilizing essence. He, consequently, thought it worth while minutely to describe the insect in its various states. Such is, in brief, Cavolini's theory of caprification, which we should have given in detail did it not appear to us to be too prolix and somewhat obscure.

3. *Exposition of the Theory of Galesio.*—Galesio, not long dead, has left a large treatise on the physiology of the fig and on caprification.

We have extracted from it in their proper places whatever appeared to us of the most importance on the fig and on the caprifig, and we now proceed to state this author's opinion on caprification. He admits with Theophrastus, Pliny, and so many others, that there are figs which mature their fruits naturally, and others that require caprification. This difference was attributed by the ancients to climate and soil, believing that in a poor soil, with a northern exposure, the fig could nourish and mature its fruit without the caprifig; Galesio, on the contrary, affirms that it proceeds from a difference in organization, that the fig requiring the caprifig is quite a different kind from the others, and that both preserve their character and temperament in any soil or climate which they can bear. Now, the diversity in their organization, according to him, is this: Some figs have no flowers capable of being fertilized, as their ovaries are without ovules; these produce no fertile seeds, and cannot feel the action of the caprifig, which they do not stand in need of to preserve and ripen their fruit. These he calls *mules*, and says it is they which are cultivated in Spain, Florence, and upper Italy. Other figs, called *semi-mules*, have flowers susceptible of fecundation, the ovaries being furnished with ovules. In these fecundation generates the embryo, which causes the nutritive humors to flow to it from the peduncles, which can only draw them from the receptacle; this, again, cannot obtain the nutriment from anywhere but from the stem, and thus the fecundation occasions the setting and ripening of the fruit. And as it is only the caprifig that can produce this effect, so caprification is necessary for the perfection of these *semi-mule* figs. Such are, he says, the figs of the Archipelago, and many of those of the kingdom of Naples, all producing female flowers only.

4. *Opinions against Caprification.*—There are many who will not admit that any effect is produced by caprification, and these are chiefly ignorant or simple cultivators, who judge from observing that in many places figs ripen without the coöperation of the caprifig. But with these must not be confounded two distinguished French naturalists, Olivier and Bory de St. Vincent, who have enounced the same opinion. The former, after having explained the process as practiced in Greece, adds: "This operation, of which some authors, both ancient and modern, have spoken with admiration, appears to me to be nothing more than a tribute of ignorance, which man pays to prejudice. Caprification is unknown in many parts of the Levant, in Italy, in France, and in Spain, and begins to be abandoned in some islands of the Archipelago where it used to be practiced, and which, nevertheless, still produce excellent figs for eating. If the operation were necessary, whether fecundation be effected by the fertilizing pollen dispersed in the air, introducing itself into the mouth of the fig, or whether nature make use of a little fly to transmit it from one fig to another, as is commonly believed, it is evident that the first fig in flower could not fecundate at the same time as those which have already attained a certain size, and those which are only just appearing, in order to ripen two months later." I do not transcribe the words of Bory, for his narration appears to me to be but a judicious illustration of what Olivier had stated.

And here I close the history with the following brief recapitulation of different opinions of authors on the mode of operating of caprification: The ancients believed that its virtue depended on the fly of the caprifig, which, by forcing its way into the domestic fig, facilitated the

entrance of light and some fertilizing or fermenting vapor, and enabled the fig to set and ripen, and that a poor soil and northern exposure produced the same effect. Tournefort believed that the insect made the figs set and ripen by pricking and biting them, giving an issue to the superfluous juices, and perhaps by communicating some peculiar humors of their own produced the saccharine maturation. Pontedera followed the ancients, whose theories were all based on that of Theophrastus. Linnæus concluded, from the observations of Pontedera on the structure of the flowers of the caprifig and the fig, that the latter could not be fecundated without the assistance of the caprifig, and that this fecundation enabled them to set more abundantly. Cavolini combined in some measure the theories of Linnæus and of Theophrastus, affirming that the caprifig fecundates the fig, and thereby causes it to bear more fruits and ripen them better; but that the same fig can also ripen its fruit in certain districts by the sole effect of soil and climate. Galesio follows Cavolini in so far as regards the action and effects of fecundation, but believes that neither climate nor soil can produce anything of the kind; and that the figs which do not require caprification differ from the others in the internal structure of their flowers. Lastly, the opinion of our cultivators is nearly that of the Greeks. They believe that the caprifig is necessary for some figs, which, without it, would lose the whole or the greater part of their fruits, whilst still sour, and that it hastens the maturity even of those figs which do not absolutely require it. They also admit that the quality of the soil and climate may, in some cases, produce the same effect as caprification.

5. *Comments on the Above Opinions.*—The ancient philosophers and naturalists admitted, as every one knows, four elements—earth, water, air, and fire—the which, combined together in various ways, produced an infinity of phenomena and things. Now, Theophrastus, wishing to explain how it could happen that the fly should cause the young figs to remain on the tree, bethought himself that, whilst the fig abounded in humidity, it was deficient in the air and heat necessary for fermentation, and that the insect, by feeding, carried off precisely the superabundant humidity, and by opening the mouth gave entrance to air and heat; and as this happened naturally in a poor soil and northern exposure, there was no occasion for the assistance of the fly. But in the present state of science, who would believe in the attribution of such powers to the soil and the north wind? On the contrary, such circumstances would rather produce an opposite effect; for the want of humidity and cold tend rather to contract the parts. And if any one were to see in the *aura cerealis* of Pliny that which is now called pollen, or the fertilizing dust generated in the anthers, would probably be mistaken, for it appears to me that the epithet *cerealis* denotes nothing but fertility or abundance produced by the *aura*. The opinion of Linnæus has, in truth, all the appearance, I do not say of probability, but even of certainty, of being simple and analogous to what takes place in a great number of vegetables. And that of Tournefort, if one does not entirely give faith to it, has, nevertheless, much of probability, considering that in other fruit trees the ovary, being pierced by an insect for the purpose of depositing its eggs, does not fall off on that account, but ripens like the others, only a little earlier.

Cavolini's theory is derived directly from Linnæus, only that his explanation of the manner in which the fecundation makes the fruit of

the fig set is ingenious, and even rational. Admitting, then, for the moment, that the fact is as stated by that celebrated naturalist—that is to say, that in certain figs the nutritive juices cannot pass readily from the branch to the fruit (on account, as he says, of the extreme tenuity and curvature of the vessels), unless attracted by the embryo generated by fecundation—yet he has not shown that in the figs which ripen without caprification these vessels are really less curved or larger. Now we have proved that the structure of the receptacle in all the varieties of fig is tolerably similar. And his observation that the fine dust of the soil might produce fecundation is now wholly inadmissible. For although towards the close of the last century there were some who believed they had obtained perfect seeds furnished with embryo, by fecundating the pistil with very fine charcoal dust, later experience has entirely disproved it. As for the virtue attributed by authors to the alkaline salts of the earth, or the phlogiston of the air, as being capable of producing the same effect, it can now no longer be supported without offending the dignity and grandeur of science. Galesio's opinion is essentially that of Linnæus, as to the importance and the action of fecundation; and he follows Cavolini in admitting that certain figs require caprification and others do not for the ripening of their fruits. But he does not see the cause of this diversity either in soil or climate, but in their different organization, believing that those figs only which have their flowers apt for fecundation require the caprifig, as well to produce the embryo as to ripen the fruit. Nothing further can be deduced from Galesio's work, in which, to my mind, there is great confusion, owing partly to preconceived and ill-defined ideas, such as that of the distinction between *mule* and *semi-mule* varieties, partly from the author not having precisely stated in what consists the diversity of structure on which he founds his theory, and, above all, from this, that he never himself saw the operation of caprification, nor examined the variety of fig on which it is performed. Moreover, his own theory, which we have perhaps stated more clearly than he does himself, appears to be in contradiction with itself in the two principal points. For if, in the variety called by him *semi-mule*, the sap of the branch passes into the receptacle, attracted by the action of fecundation and the vital power of the embryo, how is it that in the other variety the same cause does not produce the same effect? And here let us repeat that the different receptacles of the same tree, of whatever sort the fig may be, do not differ from each other in the least in the organization of the vessels, the parenchyma, and the fibers.

Such are the ideas of authors on caprification. Were we certain that Theophrastus and Pliny had intended by the word *aura* to denote the pollen, all would have joined in one general idea, that of fecundation. But in the history of the different opinions, as given above, one remarkable fact is included, which may not appear at first sight, which is, that with all the subtle fancies conceived by authors in their theories and explanations, not one of them has put forward a single experiment; but all, preoccupied with the certainty of the fact, have aspired at nothing but discovering the reason—even those who had good opportunities of actual observation. And Olivier, in denying to caprification any power whatever, comes to that conclusion not by experience, but by a just and rational operation of the mind.

But as it appeared to me not only worthy of the labor, but most essential to the consideration of the subject, to ascertain the truth by

experiment, I have applied to it all the care in my power. The questions I have chiefly endeavored to solve are:

1. Does the caprifig fecundate the flower-heads of the domestic fig, and make them remain on the tree in greater numbers?
2. Does the caprifig fecundate the female flowers of autumnal figs, and make them set?
3. Does the caprifig hasten the maturity of the autumnal figs, or of the fruit of any sort of fig?
4. Does the caprifig operate by means of the puncture made by the fly?
5. Does the caprifig operate in any other way than any of the preceding, and by any process as yet unknown?

The figs near Naples which always produce fruit are chiefly of two kinds, the Colombro and the so called Paradise fig. On two middling-sized trees—one of each of these kinds—I suspended towards the end of April some *cratiri** of the caprifig, called by our cultivators *Mamme di propichi*, or *caprifig teats*. The fly entered the flower-heads of the fig, but they did not set in greater numbers on each branch than was the case on similar fig trees not caprifigged, and growing far from any caprifig. In the ripe figs I could not find a single seed with an embryo; they were all sterile; some quite empty, others containing albumen only, and when sowed would not germinate.

At Baja the Dottato fig almost always ripens its fruit. Whoever passes by that district will readily observe places where the Colombro and the Dottato figs are so close to the caprifig that their branches intermix. Yet there are no signs among them of early maturity, when compared with similar fig grounds far from any caprifig. These figs naturally do not bring all their fruits to perfection; those that fall are at Baja called *Sbufoni*, and this usually takes place about the end of May or the first half of June.

In these fallen fruits, in the vicinity of the caprifig, there are generally dead flies, and never seeds with embryos. Out of fifty figs recently fallen from a Colombro, which I examined on June 17th, five only contained no insect; the remainder had them in greater or less numbers, but were so destroyed inside, and black and rotten, owing to the insects which had died in them, that to all appearance that was the cause of their falling. On the same tree were a number of figs looking nearly ripe, but slightly pricked and insipid, and which fell off with a slight shaking of the tree. Some of these contained insects, others did not; the former, like the fallen ones, were destroyed, and black inside. As to the permanent or set fruits, which in the middle of June can well be distinguished from the others, there were some with the insects, others without. In the fallen fruits of the Dottato fig I did not find one which had not the fly; but among the permanent ones there were some free from it. These experiments and observations were repeated three consecutive years, whilst every attempt proved vain at making the seeds of these figs germinate, though they were sown under a variety of circumstances, and at different seasons. The fly, therefore, which issues from the *cratiri* of the caprifig towards the end of April produces no effect on the domestic fig, either in fecundating their female flowers or in making

* These are explained in the first part of the memoir to be those young figs of the caprifig which first appear in September, and remain through the winter till the following spring, when they come into flower.

them remain on the trees, or in hastening their maturity. If in the latter respect a precocity may sometimes be observed, the difference is so slight as not to be taken into account, considering the diversity of aspect, the trees being more or less exposed to the sun. The size of the tree, the being single and uncovered, or choked by the surrounding vegetation, may also occasion some difference, even at very small distances. Indeed, the different branches of one and the same tree ripen their fruits at different times. That the Dottato fig should ripen its fruits at Baja is not to be attributed therefore to the caprifig planted there, but solely to the climate, or perhaps to the soil, for the same variety near Naples will produce nothing, even with the caprifig, and in other localities will do as well as at Baja without it. And on the Lardaro fig, which never ripens naturally, at least in the vicinity of Naples, although the fruit enlarge considerably, and some remain on the tree till the end of May, often as I have attached to it the *cratiri* of the caprifig, I never observed a single one ripen. Therefore, I conclude that the remaining and maturing of the figs depend upon two circumstances—the intrinsic properties or natural disposition of the variety, and on the quality of the soil and climate.

6. *Does Caprifigation Hasten the Maturity of Late Figs?*—In the district of Portici I made the following experiment: In a large property there were two small trees of the Sarnese fig, distant from each other about two stone throws, and about equal in size and vigor. To one of them only, about the end of June, I hung the flower-heads of the caprifig, and I counted the fruits upon each tree. In the first days of September there was no difference between them. Each had some ripe figs, some still sour, and others commenced ripening. Counting them again, there was here also no difference, each tree having lost about a fourth part of its fruits. The following year I repeated the experiment, with some modification. I marked with thread or with twine the figs into which I saw the fly had penetrated, and I took care that there was no caprifig in the vicinity of the other tree. The result of this experiment was precisely the same as that of the preceding year. In the meantime I had suspended five flower-heads of the caprifig to a large branch of a Lardaro fig which rose considerably above the rest of the tree, thinking that however little the caprifig might hasten the maturity, the slight difference would nowhere be more perceptible than in the different branches of the same tree. Yet when maturity commenced numerous fruits on all parts of the tree were in the same state as those of the branch in question. Now it appears improbable, not to say impossible, that those five caprifig flower-heads should have furnished insects enough for so great a number of figs.

I repeated the experiment for four years, and always with the same results, though in different localities. At the Camaldoli, where caprifigation is not practiced and the caprifig very rare, I caprifigged copiously a Dottato fig and two white fig trees, and none of the three showed the least sign of precocity. I believe, therefore, that the insect does not at all hasten maturity. It must only be observed that maturity is not to be confounded with a certain early softening which happens to some of the deciduous fruits pierced by the insect. For, as will be seen hereafter, the fly destroys and corrupts the inside of the fig; when it is already disposed to fall, it falls the earlier, and by rotting inside becomes soft the sooner.

7. *Does Caprification Cause Late Figs to Set in Greater Numbers than Usual?*—The advocates of caprification affirm that in certain varieties it causes all, or the greater number of fruits, to remain on the tree, which otherwise would have fallen off. To verify this assertion I have many times made the common experiment which would occur naturally to any one, that of comparing fig trees of the same variety to some only of which the caprifig had been brought, in order to observe the difference. Those I have observed with that view are the Lardaro, the Sarnese, the Colombro, and the Sampiero. With regard to the first two, the experiments were made in different localities, especially on the Sarnese, which is very common. None of them showed the slightest effect of the action of the fly, in regard to the quantity of the fruit; and if ever any differences were exhibited between the caprifigged trees and those not acted on by the caprifig, either in favor of or against caprification, they could always, on being well considered, be clearly traceable to other causes (not to speak of soil, climate, vicissitudes of seasons, etc.), as for example, to the age or vigor of the subject, the number of branches, the having been or not enfeebled by a previous superabundant crop, etc. And what I say of the Sarnese may in like manner be said of the Lardaro, with this exception, that being cultivated almost exclusively in the immediate vicinity of the Capital, I had no opportunity of observing it in distant localities. Cultivators affirm that this variety more than any other stands in need of caprification, and indeed it loses generally nearly the half of its fruits. But of this variety I will only state two things, not to fall into lengthy repetitions: First, that the caprifigged trees lose also a great quantity of their figs; and next, that those not caprifigged ripen many of theirs, with such differences as are occasioned by the above-mentioned causes or others to which I shall presently advert.

The double-bearing figs, such as the Paradise, the Colombro, and the Sampiero, usually bring many of their early figs to maturity, and but few or none of the late ones; and cultivators affirm that by caprification an abundant second crop may be obtained. Although I had often seen the Colombro ripen many of the late crop without the caprifig, I nevertheless wished to see the results of comparative experiment. Therefore, in the beginning of July, in the neighborhood of Pianura, I gave the caprifig to several trees of the Colombro fig; amongst them many had lost all their figs by the middle of August, some retained a few; they had fared like other trees of the same sort not caprifigged and placed at a considerable distance. Amongst the fallen fruits some contained the insect, others did not, and it was the same with those that remained on the trees and were advancing toward maturity. Amongst these Colombro figs were several trees of the Sampiero, of which four were caprifigged. The result was that two of them lost all their figs, both those at the base of the fruit-branches, called *pedagnuoli*, and those of the extremities, called *cimaruoli*. The other two trees scarcely ripened a fourth part, and those chiefly *cimaruoli*, and the fly had penetrated into some of the fallen fruits. It must be noted, moreover, that the above fig trees were all of the same age, in the same soil, with the same exposure, and all more or less had brought to maturity a good, early crop. The same experiment, repeated at Ischia on two trees of the Colombro, produced no result. For if these trees were pretty well loaded, the same thing took place in many other parts of the island without caprification, and

not infrequently in the same places were fig trees near to each other, some with and some without fruits, without anything appearing to show a probable reason for such diversity.

8. *Does the Caprifig, by the Assistance of its Insect, Fecundate the Female Flowers of the Late Figs?*—As soon as botanists learned, from the observations of Pontedera, that the flowers of the different varieties of the domestic fig were always all female, as well in the early as in the late flowers, and as they believed that the caprifig was the male plant, they at once, by common consent, without further observation, concluded that these female flowers could only be fecundated by means of the insect—recognizing in this a providence of nature for the accomplishment of that important function. And I, myself, having ascertained the correctness of the fact stated, came naturally to the same conclusion, although I had ascertained that the caprifig was not the male of the fig, but a very different plant. But in the course of time doubts gradually suggested themselves to my mind, to remove which I devoted myself to ulterior researches. First, it appeared to me impossible that in all sorts of early figs there should never be a single fertile seed, even when male flowers were present. Yet, after repeated examinations, I always found such to be the case. This must not excite surprise, however, on considering that the flies which enter these come from the *cratiri* (the young figs of the caprifig that were first formed in the previous autumn), in which are either no male flowers or very few, and those almost always imperfect, and with little or no pollen. And then, if in these early figs I occasionally found a male flower, it was only formed long after the female flowers, and its anthers never opened, so that any one might conclude that if there were no fertile seeds it was for want of fecundation. What is surprising, is the fact that in the late figs the embryo is produced especially in the *pedagnuoli* (at the base of its branches), and in hot situations, whether the tree be caprifigged or not. The White fig, the Dottato, and others which the Neapolitans do not caprifig, produce abundance of fertile seeds, even in places where caprification is never practiced, and where the caprifig itself is rare, as, for example, at Camaldoli, Ischia, etc. But such observations always leave some doubt whether the insect may not have come from somewhere else, and effected fecundation. In reply to which it must be remembered, in the first place, that this insect, when he issues from his nest, flies with difficulty to any considerable distance; and next, that after he has entered the fig he dies there, and is afterwards to be found either entire or partly decomposed; at the least there remains, as a sign of his having been inside, a brown spot, which easily turns to decay.

Now, in places where there are no caprifigs, and where caprification is not practiced, I have found the seeds perfect in figs which did not show the least sign of the insect having penetrated. Besides, towards the middle of July I impregnated artificially thirty flower-heads on a Lardaro fig, by introducing into the aperture the pollen of the caprifig; one month after ten of them had fallen from the tree without their seeds being fertilized, and the remaining ones did not differ, either in size or in the number of fertile seeds they contained, from the numerous others of the same tree which had neither been caprifigged nor artificially impregnated. Not satisfied by all this, I made three consecutive years an experiment which appears to me more important than all the above-mentioned observations. Before any flies began to issue from the

caprifig flower-heads, I closed the apertures of some still small figs of the Lardaro and Sarnese varieties with gum arabic mixed with chalk, so as to prevent the insect, should he attempt it, from penetrating withinside; and I took care to add some of the mixture as the figs grew, to keep them well closed. When they attained their full size I opened them; they showed no sign whatever of the fly having penetrated, yet they contained seeds with perfect, well-formed embryo. If this experiment is made upon trees to which the caprifig is afterwards applied, it is a curious thing to see the fly, after issuing from its nest, seek a place to deposit its eggs, and, lighting upon the closed fig, exert itself with all its might to penetrate all around the mouth, trying to force it open where it was only slightly green, and finally, seeing all its endeavors hopeless, turn away from it. This experiment clearly proved that caprifigation was not necessary to generate the embryo of the fig, though it was not conclusive as to impregnation not being requisite. For it might have happened that some organ or other under some strange form might contain the pollen, and be found on or amongst the female flowers.

With this view I examined with the microscope, with all the care in my power, all the internal parts of the fig in every stage, from its first appearance to the attaining its full size—the scales under the mouth, the pedicels, the bracts, the perigone, the pistil from the base to the summit—and I never succeeded in discovering anything which contained pollen, or any other analogous substance which might be even suspected of producing impregnation. Only it must be observed that on the style, from its young state till shortly after the changes that take place in the ovulum, or about that time, there appear certain obscure grains, which at first sight have some resemblance to those of pollen. On attentive examination they proved to be little glands with the appearance of wrinkled grains, composed of cellular tissue; and as they first appear so they remain. The same grains appear also in the caprifig and in exotic figs. Besides, it appears that the style has not the tissue for conducting the pollen, unless you would give that name to the internal part of the style, formed of longer and more slender cells than those of the exterior, as may be so frequently observed in lengthened slender organs of numerous dicotyledonous plants. Thus every attempt on my part to discover any need of the fecundating substance of stamens to produce the embryo had failed. And, if I am not mistaken, this is not an isolated fact in the science, Mr. J. Smith having (Transactions of the Linnæan Society, 1840) already announced that the female of a dioecious plant, indigenous to New Holland, of the family of *Euphorbiaceæ*, called by him *Coeleboggyne*, bears in London* fertile seeds without a male flower having been discovered on it, and without any suspicion that it could have been impregnated by the pollen of any allied plant; and whoever, in answer to what I have stated of the fig, should allege the assertion of Linnæus, that this tree only produces good fruit where the caprifig grows, must recollect what I have said respecting it—that differences in climate and season more or less hot cause more or less of the seeds to remain empty, and that on that account, in the northern parts of Europe and in stoves, the seeds would probably always remain sterile.

* At Kew Gardens.

So it is with our Vernino fig, as to the fruits which it ripens in the open air in November and December, and with that treble-bearing La Cava fig, which will sometimes ripen in a room in the depth of winter. On the other hand, the appearance of the summer figs at a time when the flower-heads of the caprifig are in a state of perfection, the insect ready to come out, shows in a manner a *final cause*, which can hardly be anything but fecundation. This consideration has always deterred me from publishing the results of the above-mentioned experiments, and has been the cause of my repeating them so often. What may be really the design of nature in this combination I confess I am ignorant of. Nor do I pretend, with the single example of the fig, to disprove so universal a fact as is the necessity of the concurrence of pollen and impregnation for the generating of the seminal embryo, proved by innumerable experiments made by so many distinguished men for a century back. I only state what I have seen in this plant, it being possible that others with a more acute judgment than my own may loosen the knot and discover one of the numerous contrivances by which nature meets so frequently her wants, when for the fulfilling of some particular end she adopts secret and complicated modes, with strange and unusual disguises.

9. *Does the Fly Cause the Setting and afterwards the Early Maturity of the Fig by the Puncture it makes in it?*—The ancients believed that the quantity of humor in the fig might be the cause of the late ripening of its fruits, or by suffocating them that of their falling off when still sour, and that whatever diminished the quantity of humor, if it did not cause them to set, at least would aid in that operation. And the celebrated Tournefort was of opinion that the insect produced that effect by piercing or gnawing the mouth, or the inside of the fig, so as to draw out the superabundant fluids. This opinion has been followed by many among the moderns, it appearing to them that the case of the fig should be in every respect compared with what occurs often in pear, apple, and other fruit trees, in which it is manifest that the blighted fruits ripen some days before the others; and Bernard, of Marseilles, a distinguished agriculturist, as I read in Galesio, is of the same opinion, it appearing to him that what happens from the fly can be proved artificially by pricking the unripe figs with an awl, or even with a straw, and putting a little oil on the puncture. But I think that such ideas and reasonings, founded on analogy, are worth nothing in the present case, for before coming to the explanation, they ought first to have ascertained whether in fact the fly does or does not hasten the maturity of the fruit, and we have already seen that it does not. Besides, it is not proved yet that the insect pierces the mouth of the fig at all, nor any other part, excepting, perhaps, the ovary in order to deposit its eggs in it; on the contrary, I believe that it never does; for looking with attention, I have observed it make its way from scale to scale, sometimes unable to overcome the resistance they oppose, nor ever breaking through any of them to clear its way; and these scales, examined under the microscope, showed no injury from the passage of the insect. But supposing the fly to have pierced or otherwise injured some scale or other, it does not follow thence that the fig must ripen earlier, when we often see it injured or gnawed away in some places—ants often enlarge the mouth and carry away the scales—and yet these injured fruits either never ripen earlier, or very rarely so, and that from other causes. That puncture and oil hasten the

maturity is proved by experiment, but this puncture operates in a different manner, in my opinion, from that which insects make into the ovaries of pears and apples to deposit their eggs. For amongst the pears and apples containing insects' eggs, some, whilst they are growing and still acid, become diseased and fall; others, continuing to grow like those that are not touched, become soft when the grub issues from the egg and commences feeding on the pulp; and this pulp is then sometimes, but not always as some believe, of a good flavor. But the fig in the above-mentioned experiment does not ripen from the puncture, but from the oil, as the same effect is produced by putting a little on the mouth of the fig. How it produces that effect on the fig is unknown to me; being put on the mouth it contracts it, then gradually the oil spreads, and wherever it reaches the dark green color of the epidermis changes to a bright green. I thought that I perceived that it did not affect the milky juice in the least, but rather impeded evaporation or other functions of the epidermis, as well in respect of light as of air, and that on that account the anointed fig commenced ripening from the base, and was inferior in flavor to those ripened naturally. But to return to the case of the fly: it neither pierces nor gnaws the substance of the fig, and if it inserts its eggs into the ovary, which I can neither affirm nor deny, it is certain that nothing is hatched from them; but I am inclined to think that it does not even pierce the ovary, as it does not prevent the formation of the embryo, and the difference between the fig and the caprifig is very great.

10. *Action of Fruits which are Ripe and in a State of Decomposition upon those which are Younger and Sour.*—In making my experiments on caprification, as I was at a loss to conceive in what manner, visible or concealed, the fly operated, it occurred to me that possibly the caprifig flower-heads suspended to the fig tree and rotting there might possibly, by their close proximity to the sound figs, excite in them some similar alteration, which might bring on a premature softening. This suspicion arose from observing in stores of apples and pears that any rotten ones amongst them readily communicated their decay to the sound. In applying this to our case I did not intend to put forth any theory on the subject, as the science has not as yet any means of determining what it is that brings on the decay of any particular fruit, nor its effect on others around it; but what cannot be known by direct experiment may frequently be admitted or presumed by analogy and comparison; and as to the present question, as we have proved that the caprifig does not hasten the maturity of figs, it follows that such a discussion is idle. Nevertheless it may not be wholly useless, I think, to take the opportunity of relating an experiment I made for the purpose of ascertaining what I have alluded to.

Oranges, when they decay, produce mold and emit an offensive smell. On that account, and by reason of their temperature being probably affected during the change, I suspected that decayed oranges might, on the tree, cause the healthy ones around them to rot; I therefore gathered several oranges with their stalks and laid them by, and as some began to rot I hung them by a bit of twine close to others which were perfectly sound. The experiment lasted about a fortnight, by which time the moldy oranges had dried up, but none of the others, not even a single one, caught the disease, and all remained sound a long time after. It then occurred to me that if the mold touched the skin of the healthy orange it might produce the decay; I therefore scattered the

dust (or otherwise, the seeds or spores) of the mold in great quantities on some oranges, and on others I introduced it underneath the skin, as a contagious disorder is inoculated. But nothing of what might have been predicted happened; the wound, instead of festering, dried up, and in one orange, which after some time began to decay, the rot appeared on the opposite side to that of the wound. From this experiment, I should say that if oranges when moldy and exhaling an offensive smell do not communicate the disease to healthy ones on the tree, and if the mold only propagates on oranges already decaying, is it credible that ripe figs of the caprifig, beginning to decompose, should produce such an effect on the young domestic fig?

11. *Examination of Fallen Figs.*—If the insect has penetrated into the fig it can be known at once by opening it, and sometimes even that is not necessary when the insect is entangled and suffocated amongst the first scales of the mouth, leaving outside its wings and the posterior parts of its body. If, however, it reaches the inside of the fig below the scales, it does not easily decay, but remains nearly entire till the fig begins to show signs of maturity; then it becomes buried in the swelling and softening florets, and soon decays. But whenever the insect dies immediately the surrounding parts turn brown, and subsequently blacken and rot, even the scales of the mouth, which are harder than the other parts, but especially the stigmata and styles in the cavity, as they project beyond the perigone and bracts, and not infrequently also the ovary and part of the receptacle. This rarely happens where the insect does not penetrate, and if the style discolors or dries up, it never becomes black or rots. At any rate, experience is a better guide than words, and a single glance of a practiced eye will tell with certainty whether the fly has been in the fig or not. Now, every variety of fig sheds a certain number of its fruits, some more, some less; and in the opinion of cultivators, the Lardaro, the Chiaja, and the Sarnese would lose all or most of theirs but for caprification. If such were the case, one would naturally conclude that what fruits should fall after caprification would be precisely those in which the fly had not entered. With this view I, one year, set to examining all the figs that had fallen from the Lardaro, the Chiaja, and the Sarnese, all caprifigged. On July 29th (the fall of the fig commences towards the end of this month and the beginning of the next) I collected under the Sarnese sixty-seven fruits, of which thirty-five had the insect; three days after thirty-one, of which twenty-four had the insect; the remainder were black inside, but without any fly—perhaps it had got out again. Afterwards I found one hundred and twenty-two fruits with the insect, one hundred and forty-one without. They were of different sizes, *pedagnuoli* which had first appeared in June, and *cimaruoli* of July.

This experiment does not prove, indeed, whether caprification had been of use or not, except that if it had worked as the cultivators believed, we ought at least to have found the largest proportion without the insect, when, on the contrary, those with the insect equaled the others, or surpassed them in number, admitting that the fly had left many. Where I made this experiment I left at a certain distance another Sarnese tree without the caprifig, under which I at several times collected two hundred and forty fruits, amongst which thirty contained the insect, which had come from other trees, although at a distance. I wished to compare the number of fallen fruits of the two trees, but I found it

almost impossible to ascertain how many fell and how many remained; and where this could be done the conclusions were fallacious, as it was difficult to find two trees of precisely the same vigor and temperament. Near the one of which I speak was a variety of the other, produced from a seed which had sown itself in the fissure of an old wall, with the fruit rather larger, the peduncle rather longer, the pulp rather finer and whiter.

On July 24th I found fourteen fruits of the Lardaro with the insect, and twenty-seven without; on the 30th, under several caprifig Lardaro trees, I collected one hundred and sixty-eight *pedagnuoli* (about an inch long), and a great number of *cimaruoli*. Of the first, sixty-six, with the styles decayed and blackened, contained the insect; twenty-nine had them similarly decayed, but the insect had probably escaped, and seventy-three without the fly had not altered inside. Amongst the *cimaruoli* some had the insect, some not. On August 2d, fifty-five *pedagnuoli* with the fly, twenty-five without, and a great many *cimaruoli*, as before. On August 9th, forty-eight with the insect, fifty-six without; on the 17th, about two hundred with the insect, and as many without. Thus, out of seven hundred and ninety-three fallen figs of the Lardaro, a little more than half (four hundred and twelve) contained the insect; the others (three hundred and eighty-one) did not, and showed no sign of decay or other change.

Of the Chiaja fig I counted of fallen fruits, *pedagnuoli* and *cimaruoli*:

Containing the fly—	
July 24th	136
July 27th	172
July 29th	164
August 3d	473
Total	945
Without the fly—	
July 24th	46
July 27th	20
July 29th	47
August 3d	127
Total	240

In this case there appears a great surplus among the fallen fruits of those into which the insect had penetrated, so that its effect appears rather to have been prejudicial. The trees had been abundantly caprifigged, and in every fruit there were generally more than one insect in the cavity or amongst the scales; but more frequently amongst these, and around the insects, there were evident signs of corruption. The fruits without insects generally showed no alteration, excepting that in some the greater part or all the styles were faded, dried up, or slightly discolored. But the results of the above-mentioned enumeration must not be considered as invariable, for the same fig tree bears very differently in different years, according to the season, as well as to the quantity it bore the preceding year; and, besides, the finding more or less of the fruits with insects depends on the greater or less quantity of caprifigged fruits suspended, and the period when that was done, as there are some cultivators who caprify three times, and then the insect is found as well in the *pedagnuoli* as in the *cimaruoli*. Last year, having returned to the same fig trees, and again examining their fallen fruits, I found the proportions a little different from those I had ascertained the previous year. In the Sarnese fig the fallen fruits without insects surpassed the

others by about a third; in the Chiaja and the White fig the numbers with and without the insect were about equal, and in the Lardaro the proportions were much the same as in the preceding year.

Although I examined an infinity of ovaries in the fallen caprifigged fruits, I never could discover with the microscope the least sign of their having been pierced by the insect to introduce its eggs, and never found anything within resembling a grub; thence it is probable that the insect does not pierce them. I say this in order to call attention to the circumstance that the blackening and decay around the ovary is not to be attributed to the puncture, which we do not know to take place, but to the body of the insect itself, which produces the effect either by some unknown action, or by some acrid humor it contains. Thus, from the above observations, it may be concluded that the fly of the caprifig is rather injurious, and that far from making the fruits remain on the tree, it either causes or facilitates their fall, especially when it has penetrated into the inside and produces decay, where it dies. But this I think will happen rather to the deciduous than to the permanent fruits, because the first, even though they be *pedagnuoli*, are by their nature disposed to fall, hold but slightly to the branch, have but little firmness in their pulp, the florets but little grown, and the inner cavity large. If with this bad conformation, either natural or superinduced pending the growth, the fly comes to inflict further damage, every one must see that the fruit cannot on that account remain longer on the tree than it would otherwise.

Amongst a great number of fallen fruits, some, whether with or without the insect, showed a few florets which had grown more than the others, and had had time to form their embryo.

12. *Examination of Permanent Figs.*—The examination of the fallen figs was naturally followed by that of those which remain on the tree to ripen, in order to ascertain whether they contained the insect, and whether it induced decay. But in this research a source of error might lie in the mistaking for permanent fruits those which might still fall before they ripen; these, however, although they may appear to hold firmly onto the bough, may be known practically by a peculiar look, by being usually badly formed, imperfectly nourished, of a paler green than the rest, and emitting when pierced a small quantity only of a thinner milky juice than the sound ones.

On August 1st I cut from a caprifigged Sarnese fig a branch bearing eight fruits; one ready to fall contained the insect; so did three others of a doubtful kind, that is to say, not showing clearly whether they would come to maturity or fall prematurely, they showed the usual blackening, although slight, of the ovary. The remaining four, intermingled with the others, were strongly attached to the bough, had no fly within, and showed no sign of alteration. Two days later I cut from the same tree another branch with sixteen fruits, of which one with the blackened styles from the presence of the fly was in the act of falling; two of middling size and firmly attached contained the insect, not in the cavity, but amongst the scales of the mouth, and were little if at all affected; a fourth, the youngest of all, although it contained the insect, appeared to be set, and was not injured. The remaining twelve, all *pedagnuoli* of middling size, were sound and secure, had neither fly nor any sign of decay. On August 5th I cut a third branch with eleven fruits all set; four contained the insect, the other seven did not. In

the district of Portici a branch of the same variety of fig with nine fruits had the insect in two fruits ready to fall and in three permanent ones. At the same time on a Sarnese fig I found, besides a number of fruits ready to fall, with the fly, thirty-seven permanent and large fruits, of which ten had the fly. From a Chiaja fig copiously caprifigged I detached in the beginning of August forty-three well set figs, of which only thirteen were without the insect, which in the others was either among the scales of the mouth or in the cavity, or in both; but always when among the scales it does little damage. And the following year, among eighty fruits of the same tree thirty-nine only had the fly, which I also found in seventy-four out of one hundred and ninety-four fruits of the White fig. In the first days of July I suspended some caprifig flower-heads to a small tree of the Lardaro which had one hundred and seventy fruits; in the course of the month forty-three had fallen; I gathered on August 14th the remaining one hundred and twenty-seven, which had become consolidated. Having opened them, I found them sound, with good seeds; about thirty only contained the fly, which had done little if any injury to the florets.

The facts noted of the Sarnese and Lardaro figs prove clearly that it is not by the effect of the insect that the fruits remain on the tree, as the greater number of those which were the soundest and most vigorous did not contain it. The experiment made the first year on the Chiaja fig might perhaps tend to show the contrary, were it not that there was so far a greater proportion of the fallen fruits into which the fly had penetrated. That arose from the great quantity of the caprifig, which had been applied three times, so that few of the fruits, whether deciduous or permanent, could escape the insect. Therefore, from the observations stated under this and the preceding heads, it follows that the insect is not the cause of the permanence and setting of the late figs. If it had been so, it would have been found only, or at least chiefly, in the permanent fruits, whereas the contrary was always observed; and I am of the opinion that a fig tree, whether caprifigged or not, always loses the number of fruits it is destined to lose, from whatever cause—either its own temperament or external causes—and that the deciduous ones fall the more readily from the flies having penetrated into the cavity and induced decay and mold; and it may happen even that on this account many a fruit falls which might otherwise have consolidated itself and ripened. As to the permanent fruits which had the fly, I think that from their size, strength, and vigor they had been enabled to resist the effects of it, especially where it remained caught among the scales of the mouth; but as soon as they commence ripening they rot very easily, the flavor becoming affected.

But as in all our researches and experiments we have been unable to discover any reason in the world why the caprifig fly should render the deciduous fruits of the domestic fig permanent, or hasten their maturity, and as it cannot be denied that some varieties lose every year a great many, others very few, and that some ripen earlier, it would be desirable to know how this happens; and this question I will now shortly discuss.

13. *For what Reason does the July Fig Commence Ripening Some Days Earlier than the Others?*—Of this fact I see chiefly three causes: First, the tree shoots out some days sooner than other varieties; secondly, it puts out but few or only very small early figs, which fall off very

soon; thirdly, the young branches do not lengthen much and grow pretty equally, throwing out scarcely any coarse, watery shoots. It follows naturally that vegetation commencing early, the flowers are also formed early, and the nutritive juices not being taken for the spring figs, nor drawn away to the extremities of the branches, are directed in greater abundance to the summer figs. What is there then surprising in their ripening a few days earlier than other varieties? The contrary effect is observed in the absence of any one of the above circumstances. The winter fig produces few small and deciduous early flowers (the growth of the branch is rather weak than otherwise), yet vegetation being about a fortnight later than in the Dottato and other figs, that is enough to occasion its fruit to ripen late. The Colombro, worn out by the quantity of early figs which attain maturity, produces late in the season only a few late ones, and those usually fall off unripe, either all or the greater part of them; indeed, that the vigorous growth of new branches retards the ripening of fruit can be proved by this, that if their ends are pinched off, the ripening will take place much earlier.

14. *For what Reasons do the White and Dottato Figs Carry their Fruits Better than the Others?*—On this occasion an important question ought, if possible, to be decided, that is, whether these figs are true species distinct from each other and from all others, or whether all the domestic figs are but varieties of one species. If we could decide for the first alternative, there would be no need of further argument, as it is natural that different species distinguished by external characters should also have different constitutions. But I will admit, although I am not convinced, that all our figs are varieties of one species. The varieties raised from seed are numerous, and in some plants infinite in some respects; but that which has now to be noticed as more especially relevant to the present question is, that sometimes the constitution is altered, so that some varieties arise which feel certain influences more or less than the natural or primitive type from whence they proceed, for in a wood of chestnuts or oaks we often see variations from one individual to another. By this I mean to say that the White and the Dottato figs, whether you consider them as species or as mere varieties, cannot be denied to have been endowed by nature with a power of carrying nearly all their fruits. But difference in habit, however slight, is usually indicated by external characters or signs; and these, caused themselves by the diversity of habit, are again the causes of other differences. So the White and the Dottato figs are the strongest and most vigorous of all those to be found in the neighborhood of Naples, and thrive in any soil. Their leaves are large, not much divided, coarse, especially those of the Dottato, and support well the vicissitudes of the seasons; and the leaf is the mother and nurse of the fruit. Vegetation in these varieties usually proceeds regularly, as they shoot in March. They set no early flowers, and the shoots are not slender, unequal, nor attenuated, but thicken and lengthen moderately; the fruits grow regularly from the base upwards, and in the order of their age; they are, moreover, of a fair size, well proportioned, and, though not few in numbers, are not crowded so as to interfere with each other's nutriment. All these circumstances together produce, according to my opinion, the above effect; and the proof is clear on seeing what are the effects produced when, from the vicissitudes of the season or other causes, the leaves suffer; or when, the sap being irregularly distributed, the branches lengthen moderately, and produce a great deal of wood. Then

the trees lose many fruits, but always less than other varieties, being supported by their intrinsic qualities.

15. *For what Reason does the Lardaro Fig Lose the Greater Part of its Fruits?*—The circumstances stated under the last two heads explain readily the cause of the Lardaro. This variety, though coarse in appearance, suffers by nature much from changes in temperature and from moisture in the atmosphere; and if the moisture is combined with heat, it causes it to throw out a great deal of wood. It produces a good many early figs, which I have never seen ripen, although they often attain a considerable size. The leaves are deeply divided, the vegetation of the branches unequal, and without order—here and there coarse shoots, which grow in a short time to a considerable length, with twenty or thirty eyes; and whilst in other figs at the end of August the shoots often cease to grow, or lose much of their vigor, those of the Lardaro continue to lengthen through September, and not infrequently through a good part of October, having always figs in the axils of the leaves. These fruits are very numerous, and many of them ill-shapen, distorted, lumpy, and of irregular growth, often two of different ages in each axil. In such a disorderly activity of vegetation, with such a number of fruits of different sizes and forms, with so much sensibility to atmospheric influences, it is not a matter of surprise that this fig should promise much and perform little, when we see that one only of the above-mentioned causes will produce the effect; for we have stated already that the Sarnese and Chiaja figs lose a part of their fruits from producing too many. Meanwhile, I have not been able to correct the defect of the Lardaro by pruning, nor by leaving uncultivated the ground where it is growing; for that has appeared always to give it new strength to replace its pruned top, and throw out coarse shoots and make wood. Age, alone, and the enfeeblement of decay tames it, and then its branches, growing little and becoming less disorderly, preserve their fruits better. The difference may be observed, also, among the branches of one tree; and this to such a degree that whoever makes comparative observations on different individuals of this variety, sees that by diversity of age, soil, exposition, disturbed vegetation, or seasons, they vary so much that he cannot easily follow the thread of explanation. But, essentially, the facts are the same as those observed in other trees—that is, that vigorously growing individuals produce little fruit, and, like coarse branches, only make wood; that those which produce an inordinate quantity lose a good portion, and that generally a scanty crop follows an abundant crop.

16. *Effects of Grafting.*—After so many experiments had proved the nullity of any supposed effects of the fly on the domestic fig in making it retain its fruits, I one day, in the village of Ischia, came upon a Colombro fig, which seemed to show the advantage of caprification in a way to turn one's brain. It was in the center of an airy, open garden, with a good soil, situated in a flat, and far from the sea, a large and beautiful Colombro fig, with a handsome, well-formed head, the bark uninjured, the wood everywhere sound, and of a vigor and health without equal. From its foot arose a fine, large caprifig, its boughs intermingling with those of the Colombro. This tree, which had ripened its early figs, had, towards the middle of August, an abundance of the late crop, almost all with the fly withinside, firmly attached, and many approaching towards maturity. At some distance were other trees of

the same fig, some with few, some with many of the late fruits, but none which approached in beauty to the other.

The circumstance of its having ripened two good crops, which, in the Colombro, so rarely happens, induced me to try and ascertain the cause. In the first place, I thought of the strength and vigor of the tree, the moderate and regular growth of its branches, the fact, of its being at such a distance from the sea as not to be affected by its breezes, and the fertility of the soil, all of which together might account for the abundance of fruit. But, after some consideration, I did not feel satisfied, and had the tree cleared at its base to ascertain whether these two trees of different natures might not be naturally united, or, as cultivators term it, grafted by approximation. I found that such was the case; and further, that the two were both united in the same manner just below the surface of the soil with a Dottato fig, a few of whose suckers grew up at a little distance.

Here were two subjects of consideration suggested: first, whether, among the various effects of the stock upon the graft in influencing the abundance of size of the fruits, a similar effect might be produced by the above-mentioned intergrafting of three different things. The second point appeared to me of more importance. The vegetation of the domestic fig, by the effect of atmospheric vicissitudes, never flags nor rests, at least sensibly, from spring to autumn, whether with the growth of the branches or of the fruits; but that of the caprifig rests a little after having produced the first crop, so that when these are ripening in June or July, the young ones of the next crop are not yet appearing on the new branches, whilst those of the domestic fig are a month old, and in full growth. Such being the case, where the stems of a Colombro and a caprifig are united, and both together grafted on a Dottato, it must be admitted, in the first place, that the roots are sufficient for all three; and, as between two trees joined at the base, the sap must pass more or less readily from the one to the other, and as the periods of vegetation of the two do not precisely agree in the present case, who would not see that the Colombro fig, forming its second crop whilst the caprifig is at rest, must receive the greater part of that which is absorbed by so many roots, and perhaps even a little of the sap of the caprifig itself? But leaving conjectures, which, indeed, are neither strange nor new, on the effects of grafting, let us return to facts easily appreciated by the senses. If the Colombro fig above mentioned bore so large a crop of fruits, not by the effect of the graft, but merely by having its boughs intermingled with those of the caprifig, the same effect ought to be produced where they are so placed without being united. And so I have seen it at Baja, but without the Colombro having, on that account, any more fruits than others far from the caprifig.

And I may now declare, that after many years' researches, and following up all the accounts and stories of cultivators, it has never happened to me to hear of any fact, however strange, new, or singular, on this subject, that might not be accounted for otherwise than by the effects of the insect.

17. *What Account should be Taken of the Maxims and Experience of Cultivators on Caprification?*—From all that is stated under the preceding heads, I should place no certain reliance on comparative observations made by the lower orders on two trees, one caprifig and the other not, to observe the differences. For as differences in humidity,

heat, rain, atmospheric influences, soil, etc., often occur, that which you may have thought you have ascertained one year will turn out quite different another. Above all, a frequent cause of error with us is, that two trees, believed to be individuals of one variety, are, in fact, two distinct varieties raised from seed, but so near to each other that cultivators do not perceive the differences. Varieties from seed have no limits in certain plants, and are produced in such numbers that often they may not be distinguished at first sight by external signs, and often these differences are only in the constitution, as, for example, in the horse-chestnut, the seeds of which, taken from one tree, will produce a hundred individuals, which may be all alike in all their parts, raised on the same soil, with the same exposure, and yet many of them differing from the others in the number of fruits they bear in proportion to their vigor, in their size, in the periods of their budding and flowering; and that happens often to certain figs which spring up everywhere about us from seed. Thus, in the commencement of my researches, I was often deceived, believing two trees to belong to one variety, when, after a time, I ascertained that they were distinct varieties; and this happens more frequently to those races to which the caprifig is given, that is to say, to the Lardaro, the Chiaja, and the Sarnese, which partake much of the wild nature, and for that reason bear so much fruit.

I have often discussed the subject with cultivators well informed, but preoccupied with the idea of caprification. To every contradiction of mine they put forward that the experience of many years had proved to them the importance of it. Sometimes we came to the proof. When I showed them fruits not caprifiged ripening at the same time as others that were caprifiged, the most sensible of them replied that that depended on the soil, but that did not affect the property the insect has of making those fruits into which it penetrates set and ripen early. If, then, I showed them the number of fruits fallen from a caprifiged and non-caprifiged tree, they always claimed the advantage; and if I said that the same fig, as the Sarnese, for instance, ripened at Ischia abundantly without the caprifig, they said that depended on the soil and on habit. Our cultivators hold it for a maxim that if a fig has once had the caprifig applied, even the White fig, which in their opinion does not require it, it feels ever after the influence; and as if having once tasted of it gets a bad habit, will the following year only produce few fruits without the caprifig. Besides, seeing the insect with so much industry and ardor work its way from scale to scale into the inside of the fig cannot, in their opinion, but produce some effect. With such and similar matter it will be admitted that I may be quite satisfied.

18. *Conclusions.*—From the facts above stated it appears clearly:

1. That to understand well the effects of caprification, it is in the first instance necessary to know the nature of the fig and of the caprifig, and what connection they have with each other. And we have seen that the caprifig is not the male of the fig, as has been hitherto believed, but a species so different from it that it may well be taken as the type of a distinct genus.

2. The structure of domestic figs, as well of those to which the caprifig is applied as of others, is perfectly similar in as far as concerns the organs of the flower, the structure of the seed, and of the receptacle; so that it does not appear how the insect of the caprifig can be necessary to some varieties only.

3. And we have seen by experiment that the insect neither hastens the maturity nor causes the fruit to set, whether of early or late figs, nor yet is it necessary for fecundation.

4. That the circumstance of the caprifig losing early many of the fruits in which the fly has not been bred, does not serve to prove the necessity of caprification, but rather to refute the doctrine completely, as the fly does not breed in the domestic fig; and besides, we have seen that when the caprifig bears a large crop of fruits, many of them fall unripe, even though the insect has been in it, and the grub be found in the ovaries.

5. And in respect of the caducity of the fruits of some figs, the causes must be sought for chiefly in the constitution and mode of vegetation of those varieties; and also in the soil, climate, and vicissitudes of the season.

6. That thus caprification is useless for the setting and ripening of fruit, and therefore this custom, which entails expense and deteriorates the flavor of the fig, ought to be abolished from our agriculture.

19. *Conjectures on the Origin of Caprification.*—Having now reached the term of my labors, I cannot conceal a certain anxiety which has secretly grown up in my mind. I fancy I hear from all quarters that the custom of caprification being of such ancient date, and having been upheld by so many distinguished men of science, both ancient and modern, cannot but be founded on experience, against which no theories, no subtleties of science, are of any avail. Verily does the rise of such ideas in my breast so agitate me, that many times in the midst of my labors my breath has been stopped by the fear that some fact illy understood has drawn a veil over my mind. Nor should I ever have ventured to publish this treatise were it not that I thought some consideration was due to the labor I had bestowed on it. Where the love for a subject induces one to undertake a work, the work itself increases that love. Besides there is the hope that, if not the whole, some part of it, at least, may prove useful to science. Of this it behooves others than myself to judge.

But independently of all such considerations, I may, in courtesy, be allowed some conjectures on the origin of caprification, and how it has become spread among us. The time when it began is entirely unknown, for the first record of it is in Herodotus, who lays it down as a proof of the dependence of the female date on the male, as of the fig on the caprifig. Certainly experience proved to cultivators the case of the date tree. Experience, therefore, many would say, proved to the Greeks the necessity of the caprifig for the fig. But it is not everything which our ancestors have handed down to us, by history or by popular tradition, that has been proved by experience, and often has analogy been confounded with experience. Let us suppose that the case of the date tree was first known, and that some one observing the caprifig, with its coarse, wild aspect, and with its fruits not good to eat containing the fly within, should have conceived the idea that it was necessary for fertilizing the fig; this would not have been a demonstration, indeed, but a plausible supposition. And how many theories are there not built upon a few facts generalized by conjecture, analogies, and possibilities? These theories, in course of time, are proved or refuted, and often last a long time in spite of refutation, so difficult is it to turn the mind away from strong impressions and preoccupations, and to turn it away from

habit; and habit is of such force that it becomes a second nature, as the old and popular saying has it. And when a maxim is once taught to the lower orders, especially to those living in the country, who are more tenacious of their habits and customs, every one knows how difficult it is to get the better of it, especially when it is connected with the hope or possibility of gain, and is ancient. Now, who can say that the custom of caprification did not rise and spread amongst cultivators in some such way? And habit is so great in this class of persons, that often they will not see their own loss and the gain of others, preferring to die in their errors rather than better themselves by the example of others.

Certain facts, either at first inexplicable or marvelous in appearance, have often given rise to popular opinion, which, from the remotest antiquity, have come down to us from generation to generation. Certainly, from the sight of the moon springs up at once the desire to know its properties; and at its brilliant and even marvelous aspect every one is naturally disposed to grant to it a large influence over the things of this world; and cultivators of old consult its phases for the periods of confiding seeds to the earth, or felling trees; from that body, in short, they deduce either the probability or the certainty of good or evil. I myself have no experience on the influence of the moon; but I believe that among popular credences, supposing them not to be all erroneous, none are more so than this on seed sowing. In vain, however, would it be to tell the cultivators of their error; all with one voice cry you down with *experience*, and you must be silent. Experience being the sensible ground for reasoning on phenomena, there is no appeal against it; and however great and numerous the proofs you have to the contrary, the general opinion, resolutely maintained, at length puts you to silence. But the case of the moon, you say, has nothing to do with caprification. But do you believe, that on seeing for the first time the different kinds of receptacles of the caprifig, the insect propagated within them, this same insect afterwards issuing forth and penetrating into the domestic fig, forcing its way from scale to scale of the mouth, in a manner which one would have been at a loss to imagine—do you believe, I repeat, that this fact would not suggest to your mind some great design of nature to be fulfilled? And this was observed by the ancient Greeks, a people of lively imagination, who in all natural phenomena, in many plants and flowers, saw secrets, and wonders, and records, and living signs of human affairs.

It is certain that the practice of caprification came to us from Greece, if we give faith to Pliny, who says that in his time it was in use in the islands of the Archipelago, and entirely unknown to the Italians; but at what precise time it was imported I am unable to say. Writers on rustic affairs in the thirteenth century speak of it as a thing practiced in some places, and they then knew not how it came amongst us. What appears to me to be interesting is, that it was adopted by us precisely as the ancients had it—the opinions of our cultivators being the same as those of the Greeks as to its utility. Among country people the most remote traditions are perpetuated without any alteration of consequence. We read, for instance, in Dioscorides, that the mandrake has secret virtues, and that it is used by witches. Now, in some parts of our country, where the plant is common, the same opinions are held of it. As I was wandering one day about some fig grounds near Naples, I observed suspended to some fig trees some of those spongy excrescences

found on elm trees, and occasioned by some aphid or pulex for the purpose of propagating within it. Having asked what was the use of it, I was answered by the cultivator that those spongy excrescences were as good as the caprifig to make figs set in abundance, and that he had been taught the recipe by his father, who had proved it, and his own experience had confirmed the advantage of it. This is, without doubt, an absurdity, yet the same thing may be read in Theophrastus; and afterwards Palladio, in his chapter on the fig, says: "And if there is none of this" (*i. e.*, of the caprifig), "a branch of wormwood may be suspended, or the excrescences which are found among the foliage of the elm." Such is one of the numerous examples of ridiculous and strange practices in use among the lower orders from the remotest periods; however contrary to reason they remain in vogue, and those who believe in them and practice them allege experience in justification. Certainly, as we have already said, experience is the groundwork of all sound reasoning or phenomena, and we ought on every occasion to follow it; but in speaking of experience, we must know by whom and in what times it was had.

Returning to caprification, from which we have somewhat diverged, neither its antiquity nor the experience of cultivators are of any account. I do not wish to disparage the labors of so many great men who have written upon it, but I only say they made no experiments; the ancients, like Aristotle and Theophrastus, relating what was the practice, and Cavolini and Galesio preoccupied with Linnæus' opinion.

TRANSACTIONS
OF THE
FOURTEENTH STATE FRUIT GROWERS' CONVENTION,
HELD AT
SANTA CRUZ, NOVEMBER, 1890.

TRANSACTIONS
OF THE
FOURTEENTH STATE FRUIT GROWERS' CONVENTION,

HELD UNDER THE AUSPICES OF THE
STATE BOARD OF HORTICULTURE, AT SANTA CRUZ,
NOVEMBER 18 TO 21, 1890.

CALLLED TO ORDER.

The Convention was called to order by Hon. Ellwood Cooper, President of the State Board of Horticulture, promptly at 10 o'clock A. M., Tuesday, November 18, 1890.

PRAYER.

Rev. A. T. Perkins opened the Convention with prayer.

VICE-PRESIDENTS.

W. H. Aiken, of Wrights, and H. H. Clark, of Santa Cruz, were chosen Vice-Presidents.

THE HOSPITALITY OF THE CITY.

By HON. G. BOWMAN, Mayor of Santa Cruz.

It is an easy matter for a committee to make a programme, but just why they should have me down to make remarks (not being a remarkable man) I can't understand. No one has ever heard me make a speech, let alone make remarks before as intelligent a body as is represented here to-day—a body of men who are solving the great problem of the future prosperity of our State. The collapse of the mining industries has given birth to this Convention. Our fair land of varied climate and soil, with its hills, mountains, and dales, needed but to be understood to make it the best country upon earth. I am satisfied the solution of our prosperity is in horticulture, and is in good hands.

Now about remarks: I suppose on account of being Mayor I am expected to know something about the commonwealth I represent. It is a theme fraught with interest. Nature has done more for this place, taking everything into consideration and the account of travelers, than any other place in America.

The mountains and ocean come together here, supplying us every day with pure sea and mountain air. Excessive heat and cold are never known. To the traveler nature tells her own story when he sees trees two or three hundred feet high, ten to twelve feet through, straight as

an arrow, vigorous, and luxuriant. We know that there are no prevailing winds, that soil and humidity are equally good. The undergrowth here is equal to that of the tropics. The summer prevailing winds are from the northwest. Our mountains protect us from those winds. In an area of about ten square miles we can grow almost anything that is grown in the world.

I believe it is the aim of all to locate in the eventide of life where they feel that they would like to stay while life lasts, and rest their bones when the struggle is over. I searched the western slope from British Columbia to Lower California for such a place, and found my ideal in the City of the Holy Cross. I sometimes think that the mantle of the prophets must have been on the shoulders of the Mission Fathers in selecting and naming this place, for we are gradually getting surrounded by locations of the most popular religious denominations.

Gentlemen, I am glad you selected the place for your Convention at Santa Cruz, and know our people will appreciate your coming. I extend to you, in their behalf, a most cordial and hearty welcome; also, with pleasure, grant you the entire freedom of our city.

ADDRESS OF WELCOME.

By Mrs. W. H. AIKEN, of Wrights.

MR. PRESIDENT, LADIES AND GENTLEMEN: We welcome you to Santa Cruz. We, as a nation, have just passed through an exciting campaign, in which every loyal American citizen entered earnestly and heartily to express his opinion in the management of a government which has no equal among nations; an inheritance from our fathers, rich in possibilities, which we are in honor bound to pass on to our sons entire, with the added value which a generation of faithful service, under the fostering care of Providence, can achieve. I say we, for although one half our number have apparently little voice in the matter, yet when our more sturdy partners go forth to express their views, it is safe to say we, in our modest way, quietly echo, "Them's my sentiments."

We of California have had our hearts made glad by the prominence our State has attained for its wonderful productiveness; the eyes of the world are upon us, and their hands outstretched for a share in our product. We gladly respond to their call, not only for their benefit and pleasure, but for the gain that may accrue to us.

Alas for the farmer, the acknowledged lord of the soil, what with the horny-handed laborer at one end, the commission merchant at the other, and the gripman in the center, he is in danger of having the life squeezed out of him. We have a champion in our statesman who has the temerity to step in just here, and back this hitherto romantic lordship with something solid to stand upon.

Leland Stanford is prepared to place the modest merit of the farmer in the fore rank of service by the substantial aid which other great interests, merely financial, have so long enjoyed, to the end of making them feel theirs was alone the prerogative. Their unexampled prosperity proves the value it has been to them, and none should know better than those who have had aid from the Government what it is

worth, and who shall say the middle man is needed in this fundamental interest of all.

I have yet to hear a valid reason to negative this. True, the banks inveigh against it, which is a proof of its virtue, as the great howl of Europe is a proof of the fitness of the tariff law for America. I have talked with many upon this measure—to loan to farmers—and while the majority are timorous in expressing a favorable opinion, few are outspoken against it; one very worthy gentleman did say, "It would lead the farmer into all manner of extravagance—he would not rest until he had his fast horses and all sorts of fads." If that is all, I should be very glad to see the farmer, who has heretofore borne the burden of life—I might say of the nation—have this burden so adjusted as to allow him to come up to the privilege of his brother banker and capitalist. I do not know that any here would object to this aspect of affairs.

Looking towards this result, there has been organized in the East a movement to which we should heartily respond, and combine our strength in an irresistible demand for a share in the results of our toil, which is the base of the prosperity of all.

He would be thought an unwise man who should erect a building without foundation, yet here we have the marvelous spectacle of a structure, the pride and boast of millions, with every one picking at the foundation. What we want is reciprocity.

I would suggest an acknowledgment of our distinguished Senator's efforts in our behalf during this sitting.

I am happy to welcome so important a body to our home, and will purposely refrain from any local allusions, since each one of us lives in the very best location and enjoys special advantages. I leave you to discover what ours are.

That your deliberations may be characterized by their accustomed spirit of harmony, striving for the best interests of all, we wish you during your stay, in true fraternal regard, to command us.

ANNUAL ADDRESS OF PRESIDENT ELLWOOD COOPER.

Vice-President AIKEN in the chair.

LADIES AND GENTLEMEN: This will be the fourteenth Fruit Growers' Convention, and the tenth held under the auspices of the State Board of Horticulture. In addressing you on this occasion, it would be appropriate to review what has been accomplished both at these ten Conventions and by the State Board, this year completing the first decade of its existence. I refer you to the Biennial Reports of 1885-86 and 1887-88; the Annual Report of 1889 and the Annual Report of 1890, which is now ready for distribution, and includes the transactions of the last Convention held in Los Angeles in the spring of this year. I cannot pass over this opportunity of complimenting our Secretary for his indefatigable efforts in having this work ready for distribution at this Convention. All those familiar with the workings of State institutions and the necessity of constant watchfulness and preparation in time, will comprehend the energy that must be given to secure the early presentation of such a report. I desire on the part of the members of the Board to express

our sincere thanks for his promptness in this regard. The fruit growers, and people of the State engaged in kindred pursuits, who can profit by these reports, and those especially who have contributed nothing towards the knowledge therein contained or the labor of compilation, should feel grateful for the privilege they enjoy in their perusal, and in obtaining such valuable information. We, the guardians of the State appropriation, receive no compensation for our labor and time given to the management and production of this work.

The reports contain essays by the most intelligent and largest fruit growers of the State, comprising the matured experience of years, failures as well as successes; and discussions by equal authority and entitled to equal attention. They treat of every branch of fruit industry as now carried on in the State, and every part of each branch, from selection of varieties to planting, and to the manipulation in every particular until the perfect fruit is presented for sale in the different markets throughout the country. In many cases the localities adapted to the successful culture of certain fruits are well defined, so that the fruit growers have at their command all the knowledge that has been obtained by the best experience. I call the attention of beginners to the reports, and repeat what I said in my first opening address delivered in Los Angeles, November, 1885: "If we expect to succeed in our fruit enterprise we must read."

The first law in the interest of horticulture was passed on March 4, 1881. A Horticultural Board soon after was organized. Prior to this organization very little united action had taken place in our State. It is true there were a few men who, as pioneers, were struggling to establish the importance of our horticultural interests, and by their publications had created that interest which secured the legislative Act, with the necessary appropriation.

I referred to this subject in my opening address before the Santa Barbara Convention, held April 9, 1888, to be found in the Biennial Report of 1887-88, pages 163 and 164, to which I call your attention:

"At the first inception of the law, fruit growers were groping in the dark, their operations were mere experiments, the results uncertain. To-day there is no uncertainty amongst the intelligent fruit growers; many branches of the industry are now a science well mastered. I venture the assertion that nowhere in the world is the business so generally and so well understood as in California. The dissemination of important knowledge, the progress made, has reached the most isolated fruit gardens, as well as the most princely orchards. Fruit growers vie with each other to discover new facts, and to disseminate them; we are united; our mutual efforts have secured for us this year a success beyond our most sanguine expectations. It is the result of our united efforts."

I think you will bear me out in the assertion that this decade marks a greater advance in horticulture than any century heretofore in the world's history. I do not wish to be understood in this statement to claim for our generation a superiority of intellect. Other circumstances have contributed to our progress—the nation, our republican form of government, the freedom and liberty of our people, our public schools. In my early schoolboy days, at the beginning of the public school system in the rural districts of Pennsylvania, it was quite common to have young men from twenty to thirty years old in these schools taking their first A B C lessons. At that time it would have been impossible to

disseminate scientific knowledge of agriculture or horticulture. How different it is to-day! In our State the most humble citizen, in his preëmpted rural home, has access to literature, and understands and practices the most improved methods that lead to success in his business. We ought to be thankful that we have such a country, such a government, and feel a deep sense of gratitude for all the blessings that we enjoy.

As successful horticulturists we meet here on common ground. There is no party politics in the production of fruits. We have to deal with the inevitable laws of nature and comply with all that she demands. We, of course, do not wish to undervalue or discourage the zeal of our people in the political controversies that take place periodically by the partisans representing the different policies of the most advanced system, because it is the safety of the Government, and without good government there can be no continued material prosperity. We, as Americans, can never be too deeply impressed with the fact that whatever evils or defects are observable in our institutions, it is within our power to remedy or remove them. We could easily draw from retirement our best men, and invest them with the offices and responsibilities of administration. Judge Story has said:

"Republics are created by the virtue, public spirit, and intelligence of the citizens. They fall when the wise are banished from the public councils because they dare to be honest, and the profligate are rewarded because they flatter the people in order to betray them."

I hope and trust that I may live to be with you at the end of the next decade, and that we shall have the same prosperous condition, witness comparative like progress in the advancement of all our interests, enjoy an equally advanced government, and that intellectually, morally, and spiritually we shall more nearly approach the divine.

At the last Convention held in Los Angeles, citrus culture elicited a very warm and general discussion. The different theories concerning the best manner of propagation would tend to create a doubt, in the minds of those about to plant orchards of oranges or lemons, as to the proper root upon which either should be grown. To me there appeared to be but little positive knowledge on this point. The range of opinion amongst the most intelligent growers is too wide to warrant successful results in the enterprise. More care and serious thought must be given to this subject. People are rushing into citrus culture more rapidly than the home nurseries can produce the trees. It will be found that the stock imported from China, Japan, or Florida is unsafe. In each case the nurserymen have no interests in the results. They desire simply to sell their stock, knowing that they would not be held responsible in the event of the early death of the trees or the spread of dangerous insect pests. Every planter should have the trees grown in his own neighborhood, or near enough that he could ascertain by trustworthy information from what seed they were produced, the manner of propagation, of budding, and the care given to them while in the nursery.

The preponderance of opinion seemed to favor the sour orange root for both lemon and orange, but this was questioned on the ground that the best citrus results could not be obtained by the passage of the sap through the orange root; and that, on the other hand, sweet oranges of superior quality could not be produced by the sap passing through the sour orange root. In regard to the function of the roots as a means of

transmitting the sap, or the chemical action that must take place before the perfect fruit is formed and matured, I will not enter into discussion at this time; but a very important question arises as to the seeds, even if we admit that the sour orange is equally adapted for both fruits. From which sour orange shall we get our seeds? There are in Florida sour orange trees adapted to the low, wet lands. In the West Indies we have the native sour orange in the high valleys and on the mountain slopes, where the land is well drained, growing into immense trees without irrigation, and adapted to a climate having two dry and two wet seasons each year. It would seem that seeds from the fruit of such trees would be more desirable. Baron Ferd. von Mueller, the great botanist of Australia, has said that an orange tree well planted and well cared for will give fruit for a period of two thousand years. A gentleman friend of mine told me that he saw an orange tree in Mexico that bore twenty thousand oranges in one season. In the employment of our time, and in the expenditure of our money, we should give our best thoughts so as to procure the greatest and most lasting results.

In our last report, at pages 97-104, will be found a most interesting essay on "Olive Culture," by C. F. Loop, of Pomona. In referring to this essay, I wish simply to call your attention to the various names of selected varieties that he recommends, and state that there are such a multiplicity of names by the different writers in the different countries, that too much reliance must not be placed in them. It is only by our own experience that we shall gain the knowledge so much desired, viz.: What variety produces the best fruit for making oil and pickles?

Many have been led to believe that our Mission olive is a seedling, and that there are many better varieties. The early priests or founders of our missions were too intelligent, and knew too well the value of the olive to risk the seeds, and if we were to draw any inferences from their work, we would naturally conclude that they probably brought the best variety that could be obtained. I certainly would incline to this opinion.

The Mission olive is a most excellent fruit both for oil and pickles, and we should proceed cautiously until we discover a better.

Insect pests menace our business. Their ravages are the greatest drawback to our success, and notwithstanding our experience we advance very slowly in counteracting them. We have had just one lesson. That lesson should impress us more seriously. It is nature's remedy, and on which we will be compelled to rely sooner or later to save our fruits. I have reference to the Australian beetle (*Vedalia cardinalis*), the importation of which achieved the almost complete annihilation in one season of the *Icerya purchasi*, the worst and most formidable insect pest ever known to civilization. Our largest citrus growers, who, one year ago, contemplated bankruptcy, and the complete destruction of their orchards, now rest without anxiety in the full confidence that their orchards are saved, and that they will be protected from the ravages of the *Icerya purchasi* in the future by this ladybug.

I call your attention to my opening address at our last Convention held in Los Angeles, to be found in the last report, pages 39 to 41. I most urgently recommend that we pass a resolution, as the sense of this Convention, asking for an appropriation of \$10,000 from our next Legislature to defray the expenses of an entomologist to Australia and adjacent islands to procure the parasitic insects as mentioned in the address referred to above, and that a committee be appointed to have the matter

in charge. We have repeatedly memorialized Congress asking for an appropriation for this object, commencing with the Riverside Convention, held in April, 1887, and at each subsequent Convention. We have not been successful, and it will be wiser to rely upon ourselves. The honorable Secretary of Agriculture will, without question, give us every aid within his power, and furnish us an entomologist with sufficient experience to assist us in the work. Let us not delay further in this matter. I hope to be able to report at the next fall Convention a second lesson.

In consular report of March, 1890, No. 144, pages 480 and 481, our Consul, Chas. F. Johnson, at Hamburg, says that the chemical Board of Examiners declared that large quantities of American sliced (dried) apples contained oxide of zinc, free from water, in such proportions as to be pernicious to health. The police department stopped the sale of such apples, and the dealers still had them on hand December 24, 1889. This, if true, should claim our most serious attention. Our interests are too great to be jeopardized by any such drying process, and our condemnation of the parties concerned cannot be too severe. This recalls to me a suggestion made at the Convention held in National City, April, 1889. I refer you to the Annual Report of that year, page 329. I recommended that one of the important measures to be adopted by the fruit growers was fruit inspection. Perfect fruit is always salable in every market. The success of the vast majority of fruit growers depends upon a combination that will secure to the consumer a good, wholesome article. There must be no doubt on this point. To surround our business with the necessary safeguards that will protect the industry, we must have fruit inspectors invested with the power to confiscate all poisonous or seriously damaged fruits, green or dried. It will take many years to arrive at proper rules or laws of inspection, hence the necessity of early commencement.

I submit these suggestions for your consideration.

THE WORLD'S FAIR.

The following communication was read:

SANTA ROSA, CAL., November 13, 1890.

To the honorable State Board of Horticulture, Santa Cruz, Cal.:

I regret exceedingly my inability to attend this meeting of your honorable body, where, I feel, so much valuable information will be accumulated. Of all pursuits, I regard that of the horticulturist the most pleasant, profitable, and honorable, and hence it is the duty of each of us to promote its interests.

I am now one of the World's Fair Commissioners at large, and our next session convenes on the very day yours does, November 18, 1890, and as very important action will be taken at this meeting, especially to the Pacific Coast, I deem it my duty to be present on the first day. Should your Convention take any action (which I think it should) urging the World's Fair Commission to set aside horticulture as a separate department, and not combine it with agriculture, then I would suggest that you telegraph the same to me or to the members of the Commission from California, at Chicago, that we may use it at the session. As one of the horticulturists of this State I am personally in favor of having horticulture as a distinct department at the World's Fair.

Yours truly,

MARK L. McDONALD.

MR. AIKEN: It seems at present they have a Department of Horticulture and Agriculture, which makes it a very large department; Mr.

McDonald desires a request to the World's Fair Commissioners to form a Department of Horticulture by itself. The response you can make to it is this resolution, and I move its adoption:

To the honorable the World's Fair Commissioners, Chicago, Ill.:

The Fruit Growers' State Convention of California, assembled at Santa Cruz, this twenty-first day of November, 1890, respectfully request that "horticulture" be made a department in World's Fair.

Adopted, and ordered telegraphed to Chicago.

COMMUNICATION.

The following letter was then read:

DIVISION OF POMOLOGY, U. S. DEPARTMENT OF AGRICULTURE,
WASHINGTON, D. C., November 13, 1890.

Mr. B. M. LELONG, Secretary State Board of Horticulture:

DEAR SIR: I have just received from your office a published announcement of the meeting of your Board at Santa Cruz, beginning on the 18th instant. It would afford me great pleasure to attend one of your meetings, and I hope at some time to do so. Will you be kind enough to express to your members the great pleasure which it will afford me at any time to do anything to assist in advancing the horticultural interests of your State. Rest assured that this division is endeavoring to serve the fruit growers of the country in an acceptable manner, and I only wish that there were more funds at my command to assist in this way. The recent special Consular Reports, which have been published in bound form by the Department of State, in answer to your question regarding fruit culture in foreign countries, is a most valuable publication, and if I but had the means at my disposal to bear the necessary expenses I could introduce from foreign lands a great many valuable fruits. At present there is not one cent I can use in this way except the little which I may be able to take from the regular appropriations of this division, which are small, and not appropriated for that purpose.

I find from the Department of State that there are no more copies of the Consular Report for distribution, and I have prepared a letter, which the Secretary has signed, asking that a second edition of not less than five thousand copies be issued, because I think it ought to be widely distributed among the growers of tropical and semi-tropical fruits especially.

Very respectfully,

H. E. VAN DEMAN,
Pomologist.

Recess was then taken till 2 o'clock P. M.

AFTERNOON SESSION.

FRUIT CULTURE; VARIETIES TO PLANT, AND NEW FRUITS.

PRUNE CULTURE.

By W. H. AIKEN, of Wrights.

The prune growers of California have reason to feel encouraged at the present and future prospects of their great industry. They have to be congratulated especially upon the protection of 2 cents per pound the Government has granted in the new tariff law, in answer to their persistent efforts and petitions to Congress for many years. This government aid is proper and timely as a protection to the American prune against the foreign prune raised and prepared for our market in great

and increasing quantities by cheap labor. Unaided in competition with foreign prunes for the American market, Americans would fail to make a living and pay American wages.

As to the policy of protecting manufactures by high tariff, there may be honest doubts, but there should be no reasonable doubt as to the propriety and justness of the protection of the prune, a product of our soil, requiring so much skilled and expensive labor in this country.

The soil and climate of this State are better adapted to the growth and preparation of the prune than those of any other State in the Union, and upon this great and growing industry our country can depend for a sufficient quantity of this healthful food fruit at such reasonable prices as are consistent with a just reward for the enterprise and expense. With a reasonable certainty of permanent protection we can safely enlarge our prune orchards, increase the care and expense of prune culture and preparation for the market of the United States without much fear of overproduction.

Increase of production and competition will no doubt result in cheapening the fruit and increasing the consumption, the demand ever in advance as we believe of the production, thus assuring the producer good profits. The crop of prunes in 1890, comparatively light, will not supply much more than one tenth of the demand for California prunes at reasonable prices, so there can be no immediate danger of overproduction.

The prune of commerce in France, known under the name "Prune d'Ente, or d'Agen," first grown in California at San José by Louis Pellier, in 1857, has become the prune of commerce in California, and is successfully competing with its French ancestor for dominion in the prune market of the United States.

The California prune is already the favorite at an advance of about 2 cents in price, owing to its rich, fruity flavor and bouquet, and especially to its endurance or quality of keeping for years without much if any loss of weight and condition. The foreign secret of preserving and packing prunes is practically unknown to us, and they may keep it if they wish, as we do not need or care to know what it is. One thing is certain, we have built up a trade and demand for the California prune in this country, and foreigners are actually trying to get our trade away from us by an imitation of our simple methods of preparation and packing for market.

The California prune is simply a dried fruit, not a foreign cooked fruit. Our prune is prepared and marketed usually in this manner: The fruit is gathered when ripe and placed upon drying trays in the open air, after having been dipped in hot lye water and rinsed in clear water, in order to crack the skin and cleanse the fruit. A week of our usual September weather will dry the prune sufficiently for the bin, when, after sweating for about two weeks and dipping in pure hot water, it is bagged or boxed for the market. The fruit should be perfectly ripe and perfectly dried; the process is simple, and can be easily and neatly accomplished. By "perfectly dried" is not meant dried to kill, but only dried to cure. Driers are used when sun-drying is not practicable. Grading the prune either before or after drying is quite generally practiced, and is advised.

The prune grown in California is no doubt the true prune of commerce grown in France; the slight differences in color, taste, and size

are owing to the heat, moisture, and soil where grown. The tree is hardy and prolific in annual crops, and can be profitably grown in most of the fruit districts of the State. There are no doubt prune districts where soil and climate combine to produce an abundance of fine, large, rich fruit, and where sun-drying is successfully practiced. The number of such favored spots have increased year by year, and are now too numerous to mention. The root upon which the prune should be grown depends upon the nature of the soil and lay of the land. The prune budded upon the peach root is preferred for planting in light, warm, well-drained soil, while the plum root is usually grown in land not adapted to the peach root.

The loss of trees from excessive moisture has resulted mainly from planting the peach root in soils not adapted to such a soft, spongy root, and also from planting the root *too deep* in the ground. The heat of our spring sun warms the soil about the root; the natural flow of sweet, healthy sap starts the tree into a thing of life, of beauty, of blossom, and of profitable fruit. Whenever you have doubt about your land being suitable for successful prune culture, owing to death of the tree or failure to bear in the vicinity, you had better raise some other kinds of fruit that have been successfully grown.

The training of a tree, year by year, in the way it should grow, requires thought and industry. No definite rule of action can be given as to the pruning of the prune tree, grown, as it is, in such a variety of soils and climates. Beauty of form, bearing space, and strength of limbs are of first importance, and any system of pruning that will lead to these results and not crowd the tree with too much wood and consequent small fruit, is worthy of careful study and practice.

Having read a paper before the Sacramento Convention in 1885 upon prune culture in California, in which the uses and values of the several kinds of prunes were fully discussed, it is not deemed advisable at this time to speak of any prune other than the one known to the trade in this country as a "prune."

DISCUSSION ON PRUNE CULTURE AND METHODS OF PREPARATION.

QUESTION: What is the proper depth at which to plant prune trees?

MR. AIKEN: The rule as practiced in this State is to plant a little deeper than they are grown in the nursery, so that the dirt may settle around the root. It is generally the practice to place the cut side where it was budded toward the north, so that the sun will not burn it. As to the question asked as to pruning, that opens up rather a broad subject, which will be discussed later in the session.

MR. STEWART: Nothing has struck me more about the prune than the admirable prunes we grow in California for stewing. I have been accustomed to the fine dessert prunes produced in Algeria, from whence they are brought to Bordeaux and there prepared, and they are sold from one to four shillings, equal to \$1 a pound.

MR. AIKEN: I will say in answer to Mr. Stewart, as I said in the essay, that we raise a California dried prune, not a foreign cooked prune. When he speaks of a dessert prune he is speaking of the French cooked prune to be eaten as dessert, and our prune is a dried fruit to be cooked

as a dried fruit, and our Eastern market now demands that dried fruit in preference to this dessert prune. We are not raising dessert prunes in California.

MR. BERWICK: I would like to ask you if you have enough sun here to dry your prunes without a drier.

MR. AIKEN: We have no driers in this vicinity; we dry them in the sun. Immediately on the coast very few prunes are raised at present; a few are raised in Soquel and vicinity, and there they have a drier. But our prunes are raised principally in the mountains at an elevation of probably one thousand five hundred feet, beyond the frost, in the sunlight and warmth; and in the Santa Clara Valley they also dry very well in the sun, so I think that in the prune districts of the State you can say almost universally that the prunes are dried in the sun.

MR. KERCHEVAL: I would like to ask if any one here has observed the peculiar condition of the prune this year. I was informed yesterday by a gentleman of Pomona, that the orchards in that vicinity were white with bloom at this time, and I would like to know if the same condition of things exists in orchards in other portions of the State, and if so, to what is it to be attributed?

MR. LOCKE: There is an old adage that a man who understands power, and knows how to use it, is a wise man; and I would add that the fruit grower who understands his soil, and knows how to use it, is also a wise man. The question has been raised here as to how deep trees should be planted in the soil. One has advised a little deeper than in the nursery. I do not remember if any one has contradicted that, but you will find in the catalogues given by nurserymen, giving directions for fruit growing, to plant your trees no deeper than they came out of the nursery, if you can find how deep that was. You have got to understand the soil. I have had many people ask me how deep to plant trees. I tell them, "Well, I don't know; I do not know your soil. If your soil is dry, and will drain off easily, then, perhaps, a little deeper—not much—than they were planted in the nursery." But then, you see, I would have to know the kind of soil they grew in; but still there should not be much difference made. It is a pretty good rule to go by to plant a tree just the same as it comes from the nursery. I have an orchard myself in the place I now live, and one would say, to look at this soil, that it was a heavy, wet soil, and that in a wet winter trees would be likely to be killed out by the water; but there is the mistake—they don't understand it at all. You dig down and find that as soon as you pass through this you come upon a coarse subsoil and clean gravel, in which the water drains right off. Now, I found in putting out a young orchard some eight or ten years ago in another place, one hundred and fifty feet higher than the old orchard, where any one would say, not knowing what the subsoil was, that if you put them lower than the nursery you will suffer, because you will be troubled with the water; but it was just the reverse. Where I put the young trees the subsoil is impervious to the water, practically, and when it rains like last winter the water stands on the surface, and the consequence is I lost ten trees there where I lost one in the other. It is a matter that must be investigated before we can give a man any directions. I would rather tell the man to plant the trees on the top of the soil, and plow around them and dig down around them for some distance, than to tell him to put them deeper than they were in the

nursery; I would tell him, as a rule, to put them the same as they were in the nursery. One thing in regard to what Mr. Stewart has said with regard to prunes. People don't always want the sweetest thing in the world. A sweet apple you can scarcely sell in this State. The kind of fruit that takes the best in America is that which has a little acid and sugar too. In reference to pruning, each man must prune to suit himself a great deal; but I have noticed that where the limbs were allowed to grow very low down they would be so full of fruit that they would almost lie down on the ground. I have seen apple orchards and pears do the same thing, and, of course, that is not the way to treat trees. Those who advocate low pruning would not allow the trees to bear so much as that, but when you undertake to thin out prune trees you have got quite a job on your hands; and what are we to do when they do that way—cut them back? If so, they will grow out the more; it is pretty hard to get around them that way. I have noticed some growers raise trees higher, especially apples and pears, so that they can get around among them. It is more advantageous to have them that way than to have them so low down that you can't get around among them; while it is more advantageous in picking to have them low down, still I think it is more than balanced to have them up to cultivate.

MR. MOSHER, of San José: In planting trees I would like to call your attention to one point, and that is the manner of planting the trees. It is customary with me when digging a hole for a tree, to take the dirt down as far as we plow, or the dirt that is exposed to the air, and lay it carefully on one side of the hole, then digging farther down in the hard dirt and putting that on the other side; then when we plant the tree we are always careful to put this top dirt in the bottom of the hole and around the tender roots, and then fill up with the hard dirt that comes from the bottom. The dirt that is thus put around the tender roots is warmer and we consider it an advantage.

MRS. L. U. McCANN, of Santa Cruz: As to the planting of trees, if you make a little hill of the surface dirt in the hole you can settle it right in and around the roots, leaving no air pockets, which is much better. I would like to ask the gentleman who read the essay (Judge Aiken), why he made no mention of the little mixture of glycerine with the last dip of those prunes, since it is said to give a shine and sort of finish to the prune that nothing else does. If we can by a little glycerine give that shiny and fancy blush, you know that brings the money that Mr. Stewart was talking about. Glycerine is not a very expensive article, and some people think it is healthy. About the pruning of the tree, the expense of cultivating one's orchard is necessarily graded by the amount of work that you do with the horse, and the low-cut tree necessarily means a great deal of hand spading, hoeing, and grubbing, which horse work has nothing to do with; therefore, I hold it is good policy, until our pockets become plethoric, to trim our trees a little bit higher, so that cultivators and plows which have the side action can be used to save hand labor. I know in some of the hot valleys it is necessary to shield the fruit as well as the ground from the intense heat, but in a properly pruned tree—and I hold, in having brought up nine children, I know something about a tree, I believe in taking off the switches when they are little—I believe that you should not wait to prune trees until you have to bleed them to death by sawing off big limbs, but like the typical child, train the tree while it is young

and it won't need very much when it is old, except the taking off according to the growth of the tree. If it is in some very fertile spot and has grown extraordinarily, say two or three yards, you need, perhaps, to cut back a little more than where the tree has been stunted in its growth. If you are going to be a fruit grower you have got to use some good common sense, and you have got to treat trees and plants as individual entities; no rule that you are going to set down in a book is going to apply to all your orchards; you have got to stand and talk with a tree a little bit and find out what it needs, and if it is growing on one side, lop it off a little and let it grow the other way—never mind your crops, let it do its own cropping. I believe the rule I have found best in pruning my trees is cutting off one third of the season's growth, trimming it back and making it a little bit stocky, and avoiding those long whip-stems that break the tree, and the crotches that split a tree, for I find that the triple bending of the limb, where you have three buds, makes trouble; for wherever a careless pruner leaves forks on each side it requires neither prophet nor philosopher to know that when the tree becomes overloaded it will split. One other question: I would like for experienced prune growers to tell me why my prunes split; I would like to know what to do to prevent it.

MR. AIKEN: In reply to Mrs. McCann as to this glycerine treatment practiced by some, it is not deemed advisable to recommend anything except pure water, because an addition of glycerine might lead to other adulteration, such as the adding of some bluing or other things to give them a blue-black color; that has been attempted. We do not advise prune growers generally to treat their fruit with anything except pure water, although there is no objection to glycerine in itself. As to pruning, as has already been said, there is no rule to apply to all cases, because in some soils the growth is very long and the prunes grow very high, and need a different treatment than in richer soils where the growth is very slow. I certainly cannot add anything to the wisdom of her pruning, only where the three branches come together we usually take out the center one so as to leave the other two, strongly fixed, to grow into branches.

MR. CHASE, of San Diego: I am somewhat interested in the prune business. Although I do not profess to be a horticulturist, I have paid some little attention to the prune business, and my investigations upon the subject have led me to believe that there is no prune produced in the known world that has been dried and put upon the market which compares in quality with the prune that we are producing here in California. You have but to take the best French prune you can find, and compare it with ours, to see that the proportion of pit and skin in it is 25 per cent more than in ours, and that the saccharine matter of the prune raised in California is fully 25 per cent greater than that found in the best imported French prune. And, sir, to demonstrate that I am not mistaken in this, I have only to refer you to our Eastern markets. What has enabled us to get from 2 to 2½ cents per pound more for our prunes in the New York market than for the best prune that is brought there? Simply because it has been demonstrated beyond peradventure that we raise a better prune than they do, and that they have no prune that compares with ours in quality; and here is one of the great sources of the confidence of the prune raisers in California. Years past our demand for prunes was limited to the lower grade, to the restaurant, to

the boarding-house, to the laboring man—very few of them were found upon the tables of our more wealthy citizens, those who indulge in the luxuries of life. But that is changed now; they find in the California prune something worthy of the best table, and it is opening up a market for us, and that market is increasing faster than our supply, at the prices stated. And I question very much, Mr. President, whether that 2-cent tariff has very much to do with it either. Those who desire our prunes will have them, and they will have them at whatever price they have to pay for them; and to-day, if the product of California was greater than is demanded in the United States, we could send it to England, and it would compete successfully with the French prune. It is not many years since we saw in the paper that some of the French producers were over here studying our system of packing prunes, and they declared that they would come over here and compete with us by following our system; but they could not get the saccharine matter in them, and that is where they failed. Now, sir, I do not know what the farmers of California would have done if they had not been protected by this tariff this year—poor, feeble, struggling industry, struggling against free labor, as you suggested. Why, sir, I had five acres and a half of prunes this season in my ground; they were five years old from the graft, and I had expended upon them in taking care of the prunes, cultivating the ground, pruning my trees, and drying the fruit, about \$250, and when I came to sum up my receipts from the sale of the fruit that I took from them, it only amounted to \$2,700, and what in the world would I have done had I not been protected? The dessert prune has not been put up by us. It may be that there is a particular kind of a prune put up in France that we haven't got, still I have never eaten a prune anywhere that was equal to the California prune.

MR. ALLEN, of San José: I have a prune orchard, and in one part of it, about one eighth, on a clay soil, somewhat wet, my prunes crack; in no other part of the orchard do they crack, and I have concluded that the wet, clayey soil and the cracking of the prune have some sort of relation of cause and effect. In investigating the subject I have learned that they are very likely to crack on the heavy adobe soil, and that it is true that they do not crack on a very generous, sandy soil, especially with a gravelly subsoil, and I thought that that might possibly be a hint towards answering the question with reference to the cracking of the prune, which is a serious defect, because it destroys largely its marketable value. I know from absolute knowledge that two years ago four tons of prunes from the summit of the mountain ten miles from here were purchased at San Francisco at 8½ cents per pound, cooked, prepared, and sold at 25 cents per pound as Bordeaux prunes. I do not think it is a difference in the prune, it is a difference in the manipulation. They were cooked, they took on the French finish and the French label, and went as a dessert fruit, and were exceedingly acceptable, and our friend (Mr. Stewart) if he had applied at the right place, could have got "Bordeaux" prunes raised on the Santa Cruz Mountains.

MR. CLARK, of Santa Cruz: Perhaps I can assist in elucidating the question of why the prune cracks, and do so from practical observation in Placer County some two years ago. At that time I owned a large ranch there known as the Gould Ranch, and a large number of prune trees were scattered amongst the peach and apple trees. Irrigation was pursued on that ranch, and these prune trees were so placed that it was

impossible to irrigate without irrigating them, and those trees had cracked prunes. It is the access to water in too great a quantity at the time that the prune ripens. I judge this to be the case from the fact that some few trees on that ranch were not so exposed, of the same kind of French prune, and they did not crack. Two years in succession I made the observations which I state, and I have made some inquiries this last year, and found that where they are cracked badly they have been in low, wet ground, or where the soil held water, or where the root could go down and get moisture about the time of the ripening of the fruit. As to pruning, no tree is properly pruned if the pruning is followed beyond the fourth year. If you do not shape your tree in that time, considering the soil it is in and the character of the tree, you never will have a tree that you can prune properly or to your satisfaction. If your soil is light or the tree needs shade, you must of course prune it low; but I think in order to get at the trees so as to cultivate them properly, where you have a soil that needs shading in a hot, dry climate, it would be better to plant them close together and obtain your shade by a little greater height of the tree; they will support one another under such circumstances, and yet you can prune them so that they will not be too high; they will not droop down if they are pruned properly, but will keep stocky, and it will not interfere with the gathering of fruit.

MR. BERWICK: I have just what Professor Allen describes—a rich loam with gravelly subsoil—and yet my prunes crack. They should not do so, but they do, and more, they mildew after they crack. I thought the cause was the moist air—I am in the fog belt in Carmel Valley—and I put the cracking down to the moist air and the fog. Now, I believe in low heads for fruit trees. I find the cost of plowing and the cost of hoeing around the trees is not very great, but I find climbing stepladders is very unpleasant, both in pruning and in picking, and I would rather have the head of the tree accessible to the ground than to get pretty close to the trunk and be thirty feet up while picking the fruit.

MR. STEWART: I know something about Mrs. McCann's place, and in my mind the trouble there arises from too much clay in the soil; and secondly, the moist air, and I think the best thing she can do is to dig the prunes up, for she will never get any profit out of them in that situation.

I. H. THOMAS, of Visalia: I object to the moisture of the soil being the cause of the cracking of the prune. In the Briggs orchard in Tulare County, where they raise fruit without irrigating, there is no time in the hot summer season but you can go and kick the soil and it is perfectly moist, and at three and a half or four feet there is water, and that produced the finest crop of prunes ever produced in the State—as high as eleven hundred pounds on a six-year old tree—and there is no cracking of prunes there; so I do not think it would be the excessive moisture, unless it is from the atmosphere, and not in the soil.

PRUNING THE PRUNE.

MR. SMITH, of Napa: I read frequently, in regard to the pruning of the prune tree, that it is claimed that after the fourth or fifth year it should not be pruned. I should like to hear from those who have had experience in that, because I have trees just about that age.

MR. ALLEN: Have you observed how much growth your five-year old trees have made beyond the bearing wood this year?

MR. SMITH: The fourth year, sir, and they have made an average, I should say, of three to four feet.

MR. ALLEN: I think nobody would question that they should be cut back, but the fifth year they will grow less than half of that, and the sixth year still less, and then I think they should not be cut back and nothing taken out except the water sprouts, and you may even find it best to leave those to take the place of a faulty limb.

SOIL FOR PLANTING THE PRUNE.

L. W. BUCK, of Vacaville: There seems to be a good deal of inquiry as to how and what to do to raise fruit, but I think that the keynote has not been said by any one here this afternoon; that is, first be sure that you get good land to plant on. I believe that a man would do better to buy at a high price good land to plant fruit trees on, than to have poor land given to him. Nor can you, as the gentleman has just now said, reverse the soil with any very satisfactory result. You may start your tree for the first year a little better, but later it will strike the poor soil if it is there, and it will fail to produce fruit that will bring a good price, and the time is past for selling a poor quality of fruit in this State for a paying price. You have got to get land upon which you can raise fruit. I believe the lady over here to my left (Mrs. McCann) has struck the keynote as near as anybody that I have heard this afternoon. I believe a tree should be pruned, and pruned thoroughly, the first two or three years after it is planted, and after it commences to bear the growth will be less. The ranker the growth, as a rule, the less fruit you will get, until the strong growth is overcome and the tree becomes large; then it will bear a heavy crop of fruit. A tree that makes a stunted growth always makes more fruit than one that is vigorous while young, and in order to keep a tree in such condition that it will not break, you have got to form a stiff, strong body, and so with the first branches that starts from the body; after that is done your tree will very seldom break. Now, in my experience I have seen several young orchards in this State that were planted on good soil that have been almost absolutely ruined by being left to bear without being pruned or thinned the third and fourth years. Men have said to me, "See what a crop I have got; I have got a larger crop of fruit than my neighbors on trees not four years old." And when their trees were four years old they were almost absolutely worthless.

MR. MOSHER: I would like to ask Mr. Buck if, considering the land was very good, he would not reverse the soil when he thought it was practicable to put the warm soil underneath?

MR. BUCK: If your soil is very good you may take and throw your tree into the ground, I don't care how, it will grow. I don't believe it is any particular advantage in reversing it. Now, as to the depth of planting trees, I will plant them certainly as deep or a little deeper than they were in the nursery rows.

CHERRY CULTURE.

By ROBERT HECTOR, of Newcastle.

It is undoubtedly because of my connection with what has come to be regarded as one of the horticultural wonders of California (the Hector cherry orchard on the American River, in Placer County), that I have been requested by you to formulate my views upon cherry culture.

I am pleased to accede to your request, although I do not pretend to be an authority on the subject in a general way. As I shall explain, my experience has been of a special kind. This may be of but little help to others, although it may be of some interest. The very unusual growth of the trees which I own, and their exceptionally large crops, and consequently large returns, have caused many inquiries to be made which it has not always been convenient for me to fully answer, and I am glad, incidentally with this paper, to give the history of the grove in question.

Early in the "fifties" the rich auriferous gravel deposits of that portion of the American River Cañon about Manhattan, Rattlesnake, and Horseshoe Bars, had attracted a large population of miners. Among others drawn by the common loadstone was Dr. L. E. Miller, a German of education and culture, who in the "fatherland" had acquired a love and knowledge of gardening and tree growing, that here, in a sheltered nook on an alluvial bench near the river's edge, he found means to indulge in and carry into practice. Beginning as an amateur, he found that his favorite pastime was a profitable one, the mining camps furnishing a very convenient and remunerative market. His garden and orchard increased in size, and in the spring of 1854 he imported from France, and planted, the cherry trees which form the older portion of the orchard I now own. Mr. J. Bost, at present a resident of Nevada City, a brother-in-law of Mr. Miller, dug the holes and otherwise assisted in the planting of the trees, and from him I learn that they were originally planted in squares, twenty feet apart. The gradual growth during the thirty-five years has rendered necessary a gradual thinning out in the rows, so that now in places there is but one row occupying the space originally occupied by three.

Casual inspection would hardly determine which trees have grown to the greatest dimensions. Measurement shows, however, that the largest tree is sixty-five feet in height and the branches cover a space of sixty feet in diameter. The trunk branches about six feet above the ground, and here has a girth of over ten feet. This being the largest tree, is the one I have naturally kept the closest record of as regards its crops. It is of the Black Tartarian variety:

The crop of 1886 amounted to	200 boxes of 10 pounds each.
The crop of 1887 amounted to	180 boxes of 10 pounds each.
The crop of 1888 amounted to	300 boxes of 10 pounds each.
The crop of 1889 amounted to	220 boxes of 10 pounds each.
The crop of 1890 amounted to	300 boxes of 10 pounds each.

Prices have varied somewhat during these years. The tree matures its fruit early for its variety, and the prices received for its crop have been good. The first cherries picked from it for some seasons brought as high as \$4 per box. They have averaged during the years mentioned at least \$1 50 per box of ten pounds. The crop of this tree for the past

five years has therefore sold for a gross total of \$1,800. Inquiry made by me in France and Germany has failed to bring to light a single instance of a tree having a record at all comparable with this. Some of its neighbors will closely approximate it, but how nearly I have not kept the records so as to determine, the hurry of the picking and packing season rendering it a very difficult matter.

As these results are exceptional, we shall of course look for exceptional natural causes, and we shall not fail to find them. The tree grows in a bank of rich alluvial deposit, which may be described as a sandy loam. It is located above the north edge of the bank of the American River, which here in its winding runs almost due west. It is in a valley formed by the depression between two spurs of the ridge which forms one side of the river cañon. This valley is sheltered by hills on the east, west, and north, and open to the river on the south. It is, therefore, protected from cold winds, and has the advantage that southerly exposures always have. The soil in its quality is exceptional, and its depth is undetermined. In the year 1852 or 1853 a test pit was dug to ascertain the possibility of reaching the gold-bearing gravel that might lie beneath it. The shaft was sunk to a depth of sixty feet through sandy loam without reaching the desired material, and was then abandoned.

The top of the bench or table upon which the orchard is situated lies about forty feet above the level of water in the American River at its ordinary stage in summer. My records of temperature are somewhat meager, but sufficient to show the results of the protection afforded by the peculiar location. During the severe cold weather of three winters ago, while the thermometer on the hills within a mile of this spot registered a depression as low as 18 degrees Fahrenheit, the temperature at my house did not go below 22 degrees.

The treatment the trees usually receive during a season is as follows: Plowing begins as soon as the weather will permit. The plowing is shallow, the furrows being from four to six inches deep, the cherry having many surface roots which I believe is best not to injure. The plow is followed by a disk harrow, and the latter by an Acme harrow. This finishes the cultivation. The trees were never fertilized until within the past fifteen years. It is my practice to spread common barnyard manure broadcast to a depth of five or six inches during the winter. I doubt not it would be the better practice to plow under as soon as distributed, but this has not usually been done. Irrigating is begun immediately after the gathering of the crop, the rather severe handling that each limb receives at picking time, in spite of extreme care, seeming to make water particularly acceptable as a tonic (if such a term be allowed in horticulture) at this time. It has the effect of strengthening the fruit spurs and invigorating the tree generally.

The picking is the most laborious, as well as most carefully prosecuted work in connection with the tree. Ladders of extra length, made portable by being attached in erect position to a stout pair of wheels, are generally used. These are held in place and kept steady by a system of guy ropes. Directions to pickers call for extreme care that fruit spurs and smaller limbs be not broken, that the fruit prospects for ensuing seasons may not be jeopardized.

My old cherry trees are never pruned, and young ones are not pruned after the third year. I prefer to have the limbs spread out in approximately horizontal position, my theory being that fewer blossoms have

all their pollen washed out by driving rains than when limbs grow stiff and perpendicular. I also believe that I secure more air and sunlight in the center of the tree. Where growth is rapid, as it has been with my trees, I have found it advisable to slit the bark in the fall and spring to prevent the natural splitting which results sometimes from trees becoming hide or bark bound.

In extending the original orchard, I planted seven years ago some cherry trees of the Black Oregon variety, which are now thirty-five or forty feet in height, whose branches cover a space thirty feet in diameter, and whose trunks are four feet and ten inches in circumference. I have, at different times, planted cherry trees in the granitic soil of the foothills, farther up from the river's bank, on my place here, and they have done well and matured valuable crops, but I have never found the tree growth to be anywhere near as rapid nor as vigorous as in my river orchard.

DISCUSSION ON CHERRY CULTURE.

MR. BUCK: This orchard spoken of is in a little pocket evidently made on purpose for a cherry orchard. It is on the American River, and, as the gentleman has stated, on a very fine, loose, sandy soil with a granitic formation.

MR. STOREY, of Santa Cruz: Is it proper to dispense with the plow and to depend solely upon the cultivator in the tilling of an orchard?

MR. BUCK: As to this cherry orchard spoken of, I hardly think it would make any difference whether it was ever plowed or not; it is of that loose, sandy formation that is never hard. I don't believe that there is anything to be gained by discarding the plow, and I believe that as a rule, especially in dry countries where there is no irrigation, that deep plowing is better than shallow.

MRS. McCANN: I have a little information as to the gumming, cracking, and bleeding of the cuticle of the cherry. The appearance of a black fungus and a good deal of gum coming out made me look at my cherry trees and question what could be done to make a healthier trunk and stop that gumming, which to my mind was a symptom of weakness and an indication that something was wrong with the cherry tree. I tried concentrated lye as a wash for the tree, and for one season it acted very well, but I found that the small boy engaged to do the work skipped places, and the next year I mixed a little whitewash with the lye, and the boy could see where he had skipped, and so could I. The result of that was a clean, healthy new bark on the old cherry tree, which I had thought to cut down if it didn't look better, but it improved and grew a clean, healthy bark. This superabundance of moisture or sap that made it bulge and swell, and the ugly black bark, all seemed cured by the application of this concentrated lye diluted to a proper solution. Since then I have found with my cherry trees that whenever I started my small boy with the strong whitewash I had clean, healthy bark and very little gum.

W. C. BLACKWOOD, of Haywards: As a general rule, I would say plow your orchard, and if your soil is deep plow deep, and cultivate afterwards with the harrow or the cultivator, and allow no weeds to grow. I have had a little experience in that. I purchased a little farm down

near Mountain View six or eight months ago, and agreed with the man from whom I bought to take care of the orchard this year; and about six weeks or two months ago I visited the orchard, and there was not a weed in it. He seemed to have done very well, still there was something about it I didn't like, and I went to a neighbor having a little orchard adjoining, and saw that his trees were about as large again as the trees in my orchard. I said: "How long have you had this orchard?" He said that he had been there a year; that his trees came from the same place as mine and were planted about the same time. I asked him how it was that his trees had made so much better growth. He answered: "He did not plow his orchard, and I had plowed mine;" and that settled the question in my mind. Now I agree that there are lands where plowing need not be done. Land that is probably moist does not need much cultivation or much plowing; but on dry soil, whether it be loam or gravel, I hold that it is best to plow; and if your soil is deep plow deep.

MR. BUCK: I think that one of the main objects of plowing is to form a deep mulch to hold the moisture. I have noticed with those people who don't plow, but simply cultivate, that the mulch formed by the cultivator is very thin. The result of such treatment is a small growth, and eventually the death of the tree; but always small, worthless fruit. I have never seen bad results from good, deep plowing, followed by good cultivation, making the soil a fine, deep mulch.

MR. MOSHER: The question as to what causes the gum to ooze from the cherry tree seems to me is a very important subject, and one that we should not hurry over. I think we are troubled with it all over the State, especially this season, and I would like to hear some discussion on the subject. I have a theory which I will give for what it is worth: I compare a tree to the human system; the sap of the tree would compare with the blood that moves in the human system; it circulates; and we know if the blood is impure it has got to break out somewhere. I think it is the same with the tree. I think that if we could purify the sap the tree would be more vigorous; because we know that when the sap oozes from the tree that the tree is not healthy. My remedy would be lime, sulphur, and salt. We know that sulphur is good for trees, for I have tried it on stunted trees that seemed to be dying, and then made a wondrous growth.

MR. CAMPTON: I had a tree once that was very badly affected with the gum oozing out, and a friend of mine told me that if I would put salt and water, simply brine, on this tree I could save it. I expect it was as bad a case as you could find, and I applied the salt and water thoroughly, and saved the tree; the gum stopped oozing, and the tree regained its former strength.

MR. CLARK: I beg leave to differ with Mr. Mosher in regard to the black or yellow gum which affects nearly all the deciduous fruits. It is, from close observation and study, a fungus. We have what we call the mildew in the grape, as many of you grape men have learned to your sorrow, which is known to be a fungus. Mrs. McCann speaks of the application of caustic lye having been successful with her; Mr. Mosher speaks of the use of sulphur and lime; lime is a caustic. He compares the tree to the human body; he speaks of sulphur. We know that sulphur is useful in many diseases of the skin in the human body, and the same remedy that applies in our practice applies to all fungous

bodies that afflict different forms of vegetation and cause such destruction in our orchards. The comparison the gentleman made was an apt one, and it is good that you are here to-day to listen to what he is saying in the matter of curing the yellow gum. Use your sulphur, use your alkaline wash, and you can put them together. I have thought that I would add a small amount, in the wash upon the bark of the tree, of sulphate of iron, that is, common copperas. I would get that as a primary wash, and then apply my alkali; it would destroy a fungous growth very quickly. You want to use it very weak, not to exceed a 3 or 4 per cent solution. This fungous growth on the bark of a tree is very delicate in structure, and they are very easily destroyed.

MR. MOSHER: Sulphur is not soluble in water, and we put lime and sulphur together, because it makes it slightly alkaline, makes an alkaline solution and dissolves the sulphur, and then by boiling you get a perfect combination, and unless you get a perfect combination you will not get the best results; it then enters into the solution, and you have to get it into this condition in order to have it come in contact and purify the sap.

MR. CLARK: You can obtain an excellent mixture to use in this case by using whale-oil soap, or any strong soap, as a vehicle to use your sulphur, lime, or caustic lye with. The soap renders the action of the lye more perfect; there is sufficient oleaginous substance in it to carry other agents, and there is no danger of injuring the trunk of the tree.

REGISTRATION OF FRUITS, ETC.

MR. PERKINS, of Alameda, addressed the Convention on the matter of nomenclature and the registration of fruits.

The said subject-matter was referred to a committee consisting of A. T. Perkins, R. C. Kells, and B. M. Lelong.

The Convention then adjourned till the following morning.

TRANSACTIONS OF THE SECOND DAY.

SANTA CRUZ, November 19, 1890.

President ELLWOOD COOPER in the chair.

INSECT PESTS AND THEIR EXTERMINATION—PARASITES
AND FUNGOUS DISEASES.

INSECT FRIENDS AND FOES.

By ALEXANDER CRAW, Entomologist of the Board.

Entomology is a very important study for fruit growers, as nearly every branch of their industry is more or less affected by injurious insects, and the experience of the past with some of the insect pests that have been introduced into California should be sufficient to make us careful to examine and disinfect all trees and plants imported into the State.

While a knowledge of how to combat and check the injurious insects is necessary, it is also of the greatest importance that we should know our insect friends, for without their assistance, even with our united efforts for the destruction of the former, we have been unable to subdue them. Could any effort of ours, even with an unlimited expenditure of money, have accomplished the same results derived from the importation and distribution of that wonderful insect, the *Vedalia cardinalis*? I am positive nothing could; for money was expended without stint by fruit growers, not in a spasmodic way, but with a determined effort to gain the mastery over the "cottony cushion scale" (*Icerya purchasi*).

This is a very good argument in favor of the introduction, propagation, and distribution of parasites and predaceous insects, as suggested by President Cooper in his opening address before the Thirteenth State Fruit Growers' Convention, held at Los Angeles, March 11, 1890. If the insects to which he called the attention of the Convention were introduced into California they would be of immense benefit, not only directly to the fruit grower, but indirectly to the other industries of the State. So let us persevere in our search for insect friends, and not relax our efforts in securing from the State and National Governments, laws and appropriations for the carrying out of this grand work.

There are innumerable foes, but I shall only mention those that to-day are attracting the most attention.

Red Scale (*A. aurantii*, Maskell).—This foe to citrus trees is to-day the most serious pest the orange growers of the State have to contend with. In the absence of internal parasites, recourse for their suppression has been had to the application of rosin washes, and also to fumigating the trees with hydrocyanic acid gas. Improvements have been

made the past season in the manner of applying the latter remedy and in reducing the expenses, that will aid in keeping this scale in check until an effective natural remedy can be found; a full account of which will be found in the reports of the State Board of Horticulture for 1889 and 1890. The twice-stabbed ladybird (*Chilocorus bivulnerus*), and its larvæ, and various other species of Coccinellidæ, feed upon this scale. The larvæ of the lace-winged fly (*Chrysopa Californica*, Coquillett) also destroy great numbers.

Yellow Scale (*A. citrinus*, Coquillett).—This scale (formerly known as the red) is found in the San Gabriel Valley, and has been for years a very serious pest in that section, and caused a great loss both in quantity and quality of citrus fruits. Since the discovery of an internal parasite (*Coccophagus*) which attacks this scale, the growers have done very little spraying in that district, and the good work of this parasite is very noticeable in a number of groves, where not over three years ago it looked as if the growers had a long fight before them. The parasite is so small that it can hardly be detected with the naked eye, and parties undertaking the colonization of it upon *A. aurantii* should select a tree or trees remote from large groves, so that the trees can be left without having to disinfect them for at least two years; in that time it can be determined whether it can be bred on the *Aurantii*. In order to stock trees with this parasite, scale-infested branches should be obtained from an orchard known to contain them. It is not necessary to place the branches on the trees; the best way is to fill boxes with wet sand or earth and insert therein the ends of the branches and place them under the tree in the shade (and on this account a low tree would be preferable); in this way the branches remain longer fresh and allow the parasites to mature and hatch. As the branches dry up more should be secured and the operation repeated a number of times so that it may prove a success. A great many conflicting reports have been circulated about this parasite, but as I am conversant with the condition of the groves in that section for the past fourteen years, I know that the present healthy appearance of the trees is due to the work of this little parasite.

Pernicious Scale (*A. perniciosus*, Comstock).—This scale is also well known, and like the preceding species has an armored hard shell; but it confines its attacks to deciduous trees, and is a very serious pest. The remedies given in the reports of the State Board of Horticulture are so cheap and effective, if properly applied, that no excuse can be tolerated for a seriously infested orchard.

About ten years ago a parasite (*Aphelinus fuscipennis*, Howard), a minute four-winged fly, made its appearance in the Santa Clara Valley on the so-called "San José" scale, but so far very little good has been observed from it in that section. A few years since this same parasite was found to be doing effective work in subduing this pest in an orchard in the neighborhood of Los Angeles, and from personal knowledge of the facts I am confident that the restoration of that particular orchard is attributable to this parasite—nature's remedy. Scales can still be found on the trees, but not in such numbers as to cause any damage.

Black Scale (*L. oleæ*, Bernard).—This scale is too well known in California to require any extended notice. Attention is again called to Mr. Cooper's address at the last Convention, wherein he quotes from the report of Mr. Henry Tryon, of Queensland, of the existence of a highly

beneficial moth, *Thalpochares coccophaga*, the larvæ of which prey upon the black scale and destroy them in great numbers, and have been known to free trees of the scales. Public attention was first called to this moth by G. Masters, at a meeting of the Linnæan Society of New South Wales, in 1885. The larvæ feed at night and form coverings for themselves with the empty skins of the scales. In this connection I may state here that I have taken the proper steps to have this moth introduced, and hope, through the assistance of Mr. Tryon, to be able to establish such a friend in our California orchards. Upon this scale we have a native internal parasite (*Dilophogaster Californica*), that assists very materially in keeping this pest within bounds. From 30 to 75 per cent of the black scales are annually destroyed by them. From the fact that only one generation is produced each year, and that this parasite only attacks the mature scale, the 25 per cent that escape, each containing eggs, are sufficient to again cover the trees.

Soft Orange Scale (*L. hesperidum*, Linn.).—Previous to the introduction of this scale in the early fifties, the orange trees in California were bright and clean, as I have been informed by J. W. Wolfskill, of Los Angeles. The scale spread so rapidly, even killing some of the large orange trees, and for a few years was such a serious pest it was then thought that orange growing would have to be abandoned. Insect warfare in those days was not understood, and instead of spray pumps or fumigating tents, the trunks and branches of the trees were scrubbed with soap-suds and sand. This had a beneficial effect upon the trees. After a few years the scales diminished in numbers, and it was thought they had run their course and would finally die out. This scale still exists, but not in such numbers as formerly, and with them we find the probable cause of their decrease. This is a small four-winged chalcid fly (*Encyrtus flavus*), one of the most beautiful of this important family. The female is furnished with a sharp stinger ovipositor, with which she pierces the scale and deposits from one to seven eggs in each. In three or four days these hatch into small, footless, blind grubs that eat out the scale, and the dead scale answers as a covering for the naked pupæ. This parasite can be found all over the State. Wherever the soft scale is numerous it is owing to the fact that numbers of ants are continuously around them, preventing the parasites from depositing their eggs. To remedy this a band should be placed around the stem of the tree, and over this tie a piece of rope previously saturated in coal oil; this will prevent the ants from ascending, and give the parasites a chance. Another chalcid parasite is found in numbers upon this scale; it is the *Coccophagus lecani*, Howard.

"Apricot Scale" (*Lecanium armeniacum*).—This is another of the scales that infest deciduous fruit trees, especially the apricot and prune. It causes great damage from the amount of honeydew it excretes, and the consequent black smut that covers the foliage and fruit. Like other Lecaniums, the greater period of its existence it is soft and easily destroyed by the washes recommended for deciduous trees.

"Mealy Bug" (*Dactylopius adonidum*, Linn.).—The climate of California is too dry for this family of scale insects to ever become a serious pest. Where they appear to thrive is in a warm, moist situation, and on this account are very troublesome in hot-houses. The fact that we have three native species in this State, and not in very great numbers, would indicate that the conditions are not altogether suitable for their

increase; for, otherwise, I believe it would be as troublesome a pest as the woolly aphis. I have found plants the roots of which were covered with them. Amongst garden plants, where it is moist and sheltered, they are occasionally found.

In my experience with this pest I have found whale-oil soap the safest and most effective remedy. Use one fourth to one half pound of soap to each gallon of water, according to the class of plants to be treated; dissolve by boiling, and apply at a temperature of 100 to 130 degrees.

About five years ago I discovered an internal parasite preying upon this coccid, that was then new to science, *Rileyia splendens*, Howard. This was a case of complete extermination, for I have been unable to find either mealy bugs or parasites in that place since.

"Cottony Maple Scale" (*P. innumerabilis*, Rathvon).—This is the cottony scale that infests grapevines, more especially those growing upon arbors, and has frequently been taken for and reported as the "cottony cushion scale" (*Iceya purchasi*). It differs from the latter in having a plain egg sac instead of being corrugated, and the female resembles a Lecanium, and loses all power of locomotion as soon as the cotton appears. There is only one generation a year. In some portions of the State this scale has been practically exterminated by an internal parasite, *Encyrtus flavus*.

"Squash Bug" (*Diabrotica soror*, Le Conte).—This is one of the most destructive leaf-eating beetles we have to contend with, and from its great numbers and migratory habits it is a very formidable pest to fight, for when disturbed it will drop from the leaf and fly to some other plant. Nearly all our fruit trees are subject to its attacks, and it also eats into and damages ripe apricots. Melons, cucumbers, beans, and other soft-leaved plants suffer severely from them. They also destroy rosebuds, carnation, and pink blooms. As a remedy, when the insects first appear spray the foliage with Paris green, one pound to two hundred gallons of water; or take five ounces of Paris green and twenty pounds of sulphur, mix well and dust on the trees or plants. But in no case should either remedy be applied to vegetables.

This beetle is attacked by a dipterous parasite, and is one of the very rare instances where a beetle is attacked by parasites. Last season I found one third of the *Diabroticas* destroyed by an internal parasite which I discovered in Los Angeles. It was found to be a new genus, and was named *Celetoria crawii*.

"Orange Aphis" (*Siphonophora citrifolii*, Ashmead).—This is the green fly or louse of the young shoots of the orange tree, and at each of the three growing periods of the tree every season they appear in great numbers, and in some instances have checked the development of the leaves. If they become serious upon young trees I would advise spraying with a weak rosin solution. They are preyed upon by an internal chalcid fly, and also by a green grub that upon first sight you would be tempted to destroy. It is blunt behind and pointed in front. This is the larvæ of the syrphus fly (*Catabomba pyrastris*, Linn.), which is illustrated on Plate V, Report State Board of Horticulture for 1890. The female deposits an oval, light-colored egg in the midst of a colony of aphis, from which the grub hatches and immediately proceeds to work. It will seize an aphis and lift it clear off the shoot, and after extracting the juice will drop the skin, and in a short time will entirely rid the trees of aphis.

"Woolly Aphis" (*Schizoneura lanigera*, Hansen).—This is one of the most troublesome insects that infest apple trees, both from its great fecundity and its ability to exist and propagate under ground, secure from the attacks of predaceous insects. This pest can readily be detected by the woolly secretions from their bodies, and also from the knotty and warty appearance of infested shoots. When young trees are infested, they can be kept comparatively free by brushing kerosene over the infested parts, or equal parts of turpentine and water applied in the same manner. Mix well while using. When the roots of the trees are infested there is no remedy so efficacious and inexpensive as gas-lime spread on the surface of the ground around the tree as far as the branches extend. Use one to two shovelfuls, according to size of tree. As this substance is of a caustic nature, great care must be taken not to allow it to come in contact with the trunk. To prevent the aphids from ascending or descending, remove the soil from the collar of the tree, and place therein some wood ashes or air-slacked lime. The various Coccinellidæ and their larvæ, also the larvæ of the lace-winged fly, assist very materially in the fight against this pest.

While upon the subject, I would like to call particular attention to the danger of introducing other species upon trees from other States and countries. Make a thorough and careful examination of all trees and plants that have recently been imported. If you have a County Board of Horticultural Commissioners invite them to assist you, as from their knowledge of the insect pests in their districts, they will be better able to detect any new insect upon the plants. This is a question there should be no effort to evade, for the sooner the owner is aware of the existence of any injurious insect upon his place, the less expensive will be its extermination, and the prosperity of the district will not be menaced. I would also state that my object in speaking of the various predaceous and parasitic insects, is not to discourage spraying or fumigation, but to call attention to and encourage a study of this very interesting branch of entomology.

CHEMICAL FUMIGATION.

By H. K. SNOW, of Tustin.

I have not the time to write any extended remarks on fumigation by the use of hydrocyanic gas treatment, but as I feel deeply interested in citrus culture, and having used this gas for several months, I feel it my duty to report, according to request.

I made my tents and commenced treating my orchard February 15th of this year (1890). I made two large tents thirty feet high and twenty feet in diameter, and two others which are twenty-two feet high and seventeen feet in diameter, out of two-ounce blue denim. I sized them first and then painted them, using lead, oil, lamp black, and spirits of turpentine, which makes them perfectly dark and tight.

My first work was done on my lemon orchard, by using on trees from twelve to fourteen feet high and twelve feet in diameter about four ounces of cyanide of potassium and four measured ounces of sulphuric acid turned into eight ounces of water, and I let the tents remain over the trees for fifteen minutes, but as the work progressed I found that the time was not long enough, and that the gas was not as strong as it ought

to be, so now we use about one fourth more material and let it remain under the tents twenty-five minutes, and for trees twenty feet high thirty minutes.

The work is very simple, and any one with ordinary intelligence can use it after seeing it done. The first thing we do to prepare to fumigate a tree twelve feet high and ten feet in diameter, is to take an earthen vessel that will hold six or eight quarts and set it directly under the tree with, say, eight ounces of water; we then weigh out four ounces of sulphuric acid, and put that into an earthen mug or pitcher, and set it alongside of the vessel with the water under the tree. We then place our tent over the tree, and one man lifts up one side of the tent and another crawls under and empties the acid and cyanide into the vessel containing the water, and puts a tin pan with cleats nailed inside over the vessel, so that it will turn the gas downwards and not spatter on the tents. He then crawls out, and the tent is let down; then see that the folds of the tent on the ground are well covered with soil, to prevent the escape of the gas, and in twenty-five minutes the tree is fumigated. I will say right here that there is not one scale left alive, where there is one hundred on the best sprayed tree ever done. I cannot say that it kills every bug when done in the best way, for there will once in awhile one escape for some reason unknown at present, but I think it is the only solution of the raising of marketable citrus fruits where the red scale (*A. aurantii*) has a foothold. Spraying with the best washes known so far will not do it, and, therefore, too much honor cannot be given to Professor Coquillett and Alexander Craw for discovering the gas treatment, and Messrs. Bishop, Wall, and Jones for putting it into practical use, by persistently working with it until they proved that it could only be done successfully in the night-time, the rays of the sun having such an effect upon the gas as to burn the foliage.

To show the difference between fumigating trees and spraying, I will state that I went into an orchard treated with gas, and picked an orange each from seven different trees that were covered with red scale, and in coming home I passed an orchard which had been sprayed with the rosin wash about two weeks, so I picked off an orange, and thought it was a good job. When I got home I took my glass to examine it, and found several young red scale; I then took a pin, and in a few moments killed seventy young scales crawling on that one orange. I then took from my pockets the seven oranges taken from seven different fumigated trees, and could not find a live scale on them.

Fumigation by hydrocyanic gas is the greatest boon ever discovered for the orange grower. It kills the black and brown scales as well as the red scale, and I have no doubt but that it will kill the San José scale also. The cost is not over one fourth to one half more than for spraying. In fumigation there is no missing a limb, nor half spraying the top; no chance to be careless or slovenly; every part of the tree from top to bottom is completely enveloped in gas, and if good judgment be used in the amount of ingredients, it may be depended on that not many scales will be left to damage your trees.

In making the tents I would recommend that the diameter be nearly as large as the height. You can place the tent over the tree easier and quicker, and with less injury to limbs and fruit. The tent folds together so completely that it can be adjusted to a small tree without waste of gas.

PRESENTATION TO ALBERT KOEBELE,

Discoverer of the *Vedalia cardinalis*.

PRESIDENT COOPER: I regret very much to announce that Hon. Frank McCoppin, of San Francisco, our late Commissioner to Melbourne, is not present. He has been unavoidably detained.

MR. COOPER then continued as follows: I have been requested to make a presentation at this Convention; the occasion and subject being considered of sufficient importance to have the ceremony recorded, and have it appear in our horticultural literature. In the month of August, 1888, Mr. Albert Koebele was sent to Australia for the purpose of searching for and procuring a parasitic insect to destroy the *Icerya purchasi*, commonly called the white scale, or in the hope, at least, that one might be discovered that would counteract the ravages of this terrible pest. The result of that voyage is too well known to most of our fruit growers for me to enter into details of what has since taken place. Those who may not be acquainted with the history, I refer to the Biennial Report of the State Board of Horticulture of 1885-86, pages 379 and 380-397; the Annual Report of 1889, pages 207-208, 266-271, and 385; and the Report of 1890, pages 53-58.

It may be well for me, however, to speak briefly of the actors that have brought about such wonderful results. The Australian beetle (*Vedalia cardinalis*) was classified and named many years ago by Mulsant. The function of this beetle was discovered by Albert Koebele. While it was known in Australia that some parasite was destroying the white scale, its disappearance was attributed to an entirely different insect, so that to Albert Koebele alone is due the honor of discovery. His name will live in this connection as long as our civilization exists.

Let us consider that although for more than ten years our most experienced, most intelligent, and most determined citrus growers were fighting the white scale, and communities were quarantining against it, it was gradually increasing and spreading, so that devastation appeared certain, all our efforts baffled, our hopes giving way to despair, and ourselves ready to bow to the inevitable and admit that we were powerless in the hands of this insect, when a few of these little ladybirds placed in our orchards, with their marvelous work, silent and unseen, in a few short months completed the extermination. Do we realize it? Can we realize it? Can we comprehend the wisdom of such a provision in nature? Has this lesson been seriously impressed upon our minds? A short period since this pest engaged the attention of fruit growers more than any other one thing. To-day we have forgotten it, and not a thought is given to what was the most alarming enemy of the fruit grower. Will we profit by this experience? If so, we will have without delay competent agents searching for parasites to destroy all the insect pests that disturb our fruit and fruit trees.

I was much impressed by an article written by Burnet Landreth, President of Pennsylvania Forestry Association, published in the "Garden and Forest," December, 1888, pages 500 and 501. The substance of this article is pertinent to the subject I am considering. Mr. Landreth was a member of a firm owning five thousand acres in eastern Virginia, on the lower Chesapeake. About two thirds of this land was covered with the original and second-growth pine, some hard-wood interspersed.

Amongst the native deciduous trees were found chestnut, walnut, ash, oak, and others. These gentlemen concluded to try forest planting on this tract. In 1870 and 1871, one hundred acres were planted with black walnuts, and eight acres with chestnuts. In 1872 to 1879 they planted 150 bushels black walnuts, 34 bushels chestnuts, 4 bushels black locusts with 105,000 seedling trees, 5,000 Southern cypress, 5,010 European larch with 1½ bushels seeds, 10 bushels hickory nuts, 3 bushels tulip poplar, 3 bushels pecans, 10,000 ailantus, 16,000 white ash, 1 bushel white oak acorns, 17,000 catalpas, and 10 bushels seeds. Besides the above some White pine, Douglas spruce, and Douglas fir were planted.

The Report.—"Some of the black locusts were twelve feet high. They gave promise of a fine locust forest. One September the locust tree borer descended in swarms, laying millions of eggs, which produced myriads of grubs, and by the next midsummer every tree was ruined. We cut them down and pulled out the roots at an expense of \$25 per acre. The European larch gave out in the trunk, the main stem breaking off at about twelve feet. The Southern cypress next failed. The hickory and pecan nuts were to a large extent stolen by the squirrels, woodchucks, and field mice. Those that did grow were plowed out, and the ground replanted with catalpas. The tulip poplar was not a success, as the rabbits and field mice during winter ate off from the tender seedlings the sweet, juicy bark, and destroyed nearly every plant. The white oak acorns were largely stolen by animals, which also ate the bark of the young seedlings. In short, with us black locusts, deciduous cypress, European larch, hickory, pecan, tulip poplar, white oak, osage orange, wild black cherry, ailantus, white ash, mulberry, and some others have all failed. Of the catalpa we have abandoned several tracts, and after most serious ravages by stray cows, half-wild pigs, rabbits, squirrels, mice, and fire, have about two hundred thousand trees left. Two years ago every tree was denuded of its leaves, within a period of a month, by the ravages of the catalpa sphinx."

This certainly is a very discouraging record, and is a matter for serious reflection. When nature plants a forest she makes no mistakes. She plants the right trees in the right place. In the forests she plants flowers, annuals, bulbous roots, flowering shrubs, and vines. All flourish in their beauty and grandeur. No enemies, insect or animal, materially disturb it—at least until invaded by man. If we wish to succeed, we must follow nature. We have in the above an example where capital sought investment, the ultimate object being increase.

On the other hand we find capital going into our mountain regions, covered with dense forests, in localities unsuited for farms or homes, and with mills and machinery the owners cut down the forests and reduce them into merchantable lumber, devastating whole regions merely that the investment may be largely increased, and have no care for the consequences. We permit it. Evidence proves that intelligent races which once flourished are now extinct, having disappeared from the face of the earth. Historians tell us that they were overrun by barbarians. I dissent from that opinion. It was wrong doing, wrong living. They destroyed themselves. Do you believe that any portion of the earth's surface before it was invaded by man was ever devastated by floods or droughts? I do not. These things come by man's destroying the equilibriums. All things were created for our use, our develop-

ment, but we must make proper use of them. We witness from year to year great climatic changes from the former condition of even a hundred years ago: unprecedented storms, tornadoes, floods, and droughts. In society are even more formidable destructive elements: monopolies, syndicates, and trusts, accumulated capital with its power tampering with the very vitals of our republic.

The pests are among us, and if we do not live rightly our destruction will surely come.

Mr. Koebele, it gives me great pleasure to present you with this token of appreciation, on the part of the State Board of Horticulture and the donors, of your services in the discovery of the Australian ladybird. It is more than probable that you will be invited to make other voyages in search of parasitic insects. Your vocation, your profession, and your experience fit you especially to do this work. That your life and health may be preserved, and that whatever mission you are called upon to undertake may be as fruitful as your mission to Australia, is the earnest prayer of the fruit growers.

Concluding, President Cooper presented to Mr. Koebele a gold watch, chain, and charm, and to Mrs. Koebele a pair of diamond earrings. The watch bears the following inscription:

Presented by the State Board of Horticulture to ALBERT KOEBELE, the discoverer of the <i>Vedalia cardinalis</i> , on behalf of the Fruit Growers of California.

President Cooper then introduced Mr. Koebele to the Convention.

MR. KOEBELE: I am very grateful to the fruit growers for this acknowledgment, and I only hope that I shall have the pleasure of again serving them.

MR. COOPER: I will state that the resolutions that were passed at the Convention in Los Angeles have been engrossed, also those addressed to the Hon. Frank McCoppin; who, I am sorry to say, is not here this morning. These presents were purchased by the two committees that were appointed for that purpose, and the balance of the money, after the purchases were made, I will also hand to Mr. Koebele. A record of the names of the donors, and all the facts connected therewith, will appear in the next annual report.

DISCUSSION ON INSECT PESTS.

MRS. McCANN, of Santa Cruz: The cherry tree produces an insect, a little black slug, that eats off all the upper coating of the leaves of the cherry, leaving them as if they had been skeletonized, and every season for two or three years I have noticed this slug upon the cherry trees. I would be very glad if somebody would tell me of some remedy for this slug. It appears as a black, oozy snail, a little over half an inch long, resembling a small tadpole. I find it also upon the pear trees, sometimes in great numbers.

MR. BUCK: This slug is quite common, although with us in Vacaville we seldom get it on cherry trees, but very much on pear trees. The thing that cures them most effectually is to have the thermometer go up to about 110 degrees, and I will guarantee you will have no slugs the

next day. Almost anything will kill them. Any kind of a wash, any simple wash, whale-oil soap reduced, anything almost that touches the slug will kill him. And, further, it is necessary that it be killed, because its presence this year will make it almost impossible for you to get a crop of fruit the next year. That is my experience.

MR. BERWICK: Slacked lime is very effectual, and an easy way of applying the slacked lime is to have an old barley sack and a pole sixteen or eighteen feet long, and put half a pound of dust or lime in the barley bag, and shake it over the tree in the morning when the dew is on the trees, and that will kill the slugs. And I want to say also with the mildew on the apple tree, a very handy way of applying the sulphur is by the same method; it is better than the bellows. It is quicker, and it does its work more effectually.

MR. BUCK: The first time I knew what this slug was I found it on some pear trees in large numbers, and I was very anxious to find out what to do. A man told me to throw dust on them, but fortunately we had one of those zephyrs from the north that raise the thermometer sometimes to 110 degrees before I got a chance to go to work at the slug, and when I went to hunt for him I couldn't find him. With us almost anything will kill them, but I presume it is largely owing to the dry, hot climate of that valley, and I presume that on the coast it would require different and probably harsher treatment.

MR. BLOCK: That insect is generally known as the pear slug. Now, if the pear tree is sprayed at the proper time, as it should be, for the purpose of destroying the codlin moth, *i. e.*, shortly after the tree gets out of bloom, with Paris green or London purple, it will destroy this slug, and the saw fly as well is destroyed with it. You can destroy the three different insects effectually with the same wash at the same time. I have never been troubled with either the saw fly or the pear slug wherever I have sprayed for the codlin moth at the proper time with Paris green. Now and then I have it on the cherry or plum, and it can be destroyed with either one of the remedies given—dust, or ashes, or lime.

DISCUSSION ON CHEMICAL FUMIGATION.

H. HAMILTON, of Orange: The expense upon a tree that contains one thousand cubic feet is about 25 cents, and larger trees in proportion. In Orange County there are ten companies of men fumigating, and they are doing the work at from 25 cents to \$1 per tree, according to the size. The work is all done in the night; it cannot be successfully done in the daytime, and for the last five months these companies have been at work every night steadily, and the work is still progressing. This kills all kinds of scale, but I want to say in reference to the black scale, that when the black scale is under a shell nothing will reach it—no wash in the world, no fumigation or anything else; you will have to take it when the scale is young, and the best time to fumigate for the black scale is in October and November. We use hydrocyanic acid gas, as given in the essay read this morning. On a tree that has one thousand cubic feet we use three ounces of cyanide of potassium, three ounces of sulphuric acid, and six ounces of water, and when we commenced this spring we allowed the tent to remain on the tree fifteen minutes, but we have found

that the work was not complete on the tree universally, and so extended the time to thirty minutes, and have since increased the amount about, as the paper says, 25 per cent, and some of them are increasing it a little more.

QUESTION: The next year does the scale remain?

MR. HAMILTON: We have only had the experience of one year with it. I want to say so far as the scale returning that there is no process found yet that will work uniformly on an old tree. I speak now with reference to the orange tree. All those who are engaged in orange culture know that the orange tree has regular periods for growth, and owing to the different conditions of trees uniformity cannot be had in fumigation and spraying. There will always be some tree that will not be disinfected by anything, and so it is necessary to repeat the process.

Q. Does it destroy the red scale entirely?

MR. HAMILTON: I am just saying that no process will make a complete job on a row of trees; it cannot be done. But the success during the past six months in Orange and Los Angeles Counties has been such that the orange trees have never looked so well before; the growth has been remarkable; the fruit is comparatively clean, and the amount of fruit has gradually increased, so that the estimate of fruit in the counties producing oranges this season is three thousand carloads. The amount of income from the crop this season is estimated at \$2,600,000. The other fruit crops in Southern California have increased this year in the same proportion, and a good many orchards that I know of report \$500 an acre profit on their apricots, and prunes in the same ratio. Prune trees have always produced an enormous crop, and Southern California is enjoying this year a fruit boom, instead of a corner lot boom.

MR. WHITE: Please tell us what effect your fumigation has on the eggs of the insect?

MR. HAMILTON: The black scale eggs, while they are in the shell, cannot be reached by anything; you have to wait until they are hatched out, and that is in September. After that is the time to fumigate for the black scale, because they are all out from under the scale; the old scale has disappeared and the young ones are there with the shell not yet formed, so that they are easily killed—almost anything will kill them, and the fumigation does it. So far as the red scale is concerned, there are no eggs; the red scale brings forth its young alive, or nearly so—they are generally admitted to be that way. I have watched, under the microscope, this spring a good deal, and I find that the red scale, when it is first deposited, will remain some fifteen or twenty minutes in a yellow, semi-transparent sac, in the form of an egg, and in about fifteen or twenty minutes it begins to show its limbs, very clumsy limbs, protruding from its sides, and then it begins to move; it crawls around for a few hours hunting for a place to locate. It is exceedingly clumsy, and if knocked off on the ground that is the last of it; it never can get up again, and if the wind is blowing or a storm raging at the time, it cleans them off so far as the young are concerned. But it crawls around when it has a favorable opportunity, and its choicest place to locate is on the fruit, and the next place is on the tender twigs or leaves, and as soon as it is located it begins to suck the sap from the tree. The black scale does not kill the tree like the red scale, but there are several species of the genus *Aspidiotus* which will do the same thing—the pernicious

scale is one, and it operates on the deciduous trees the same as the red scale does on citrus trees. No man has yet reported having seen the male of the black scale or any other *Lecanium*; if any man has, I would like to have him report. But so far as the red scale is concerned there is always an abundance of males, and they are never more than one third the size of the female; that is, they don't develop more than that. They have very long wings, and as soon as they are out of their shell they are ready for the operations of life. The female has no wings, and how she gets from tree to tree is a problem. I have not any doubt in my mind but that she is assisted by the male, because he has wings sufficiently large to do all this work. The length of time the red scale is operating on the tree is the whole season through. In the spring there will be but very few of them, because the winter has killed quite a large portion of them; the rains are especially destructive to the red scale, and the winds also prevent them from increasing in the winter, and in the spring there are very few on the tree.

MR. WHITE: How about the white scale?

MR. HAMILTON: We have none in our county, and the problem of the white scale is already solved by the *Vedalia cardinalis*.

MR. STOREY: Would you think if a man sprayed for the black scale in September, October, or November, he would be troubled afterwards?

MR. HAMILTON: If he is fortunate and gets a good job, he will not have to spray again for two years.

MR. STOREY: Tell about the cost and expense.

MR. HAMILTON: It costs about \$300 for an outfit. The company handled four tents. The report of the State Board of Horticulture for 1890 gives the drawings of the outfit. I will say that two tents are put upon one wagon, with a mast and a crossbar on top, and at the end of the bar a tent is suspended; they have guy ropes, and it is lifted and shoved along from tree to tree. Three men will attend to four tents.

MR. STOREY: How would you operate with a tent on a steep hillside?

MR. HAMILTON: You would have to haul your wagon up the hill, so as not to run on the hillside. If the trees are not very large you can use hand tents, which have a gas pipe through the bottom rim to keep them spread, and three men will place one over the tree and do the fumigating, and then lift it off and go on with it. If the trees are small, especially on the hillside, they can do it in that way.

N. H. CLAFLIN, of Riverside: The expense of fumigation depends very much upon the management, the number of tents used, and the manner in which the work is done. I have reliable information from Dr. Dunn, who has been doing the work in San Bernardino County, to the extent of five to seven thousand trees, the oldest twelve years old, and the youngest four years of age, at a cost of from 7 cents for young trees to 20 cents for the old. But the way he manages to do the work at that price is by having at least three of the outfits for the tents, so that he can put them over the large trees from the derricks, and, in addition to that, having some of the hand tents that were spoken of by Mr. Hamilton, of Orange; and all trees ten feet in height, or less, the men put the hand tents over, and in that way they get along much faster. I think in the use of fumigation for the black scale on the olive tree, that after once getting prepared, and the men learning how to do the work economically, that the scale can be killed on the trees at an expense not to exceed 20 cents for large olive trees.

MR. COOPER: I wish to correct one statement in regard to the spraying of the olive trees. The black scale, in the coast counties from, probably, San Francisco to San Diego, near the coast, commence to hatch from the twentieth of June to the twentieth of July, and they continue to hatch up to the end of February, so that it is a very difficult matter to fix upon any special time to spray the trees or to treat them with gas; it would have to be done twice each season.

Adjourned till the following morning at 9 o'clock.

TRANSACTIONS OF THE THIRD DAY.

SANTA CRUZ, November 20, 1890.

President COOPER in the chair.

SELECTING, PREPARING, AND MARKETING FRUITS.

FRUIT SHIPMENTS OF 1890.

By Vice-President L. W. BUCK.

It is not necessary for me to tell you that California is a great fruit-growing State, and that the capacities of California are but little touched as yet. The thing for us to consider is the kind of fruit to be raised to the best advantage and where to raise it. We have within our borders every variety of climate and soil almost that is found in the United States, from extremely poor to some of the finest. We have a great variety of climate, and the conditions of the soil and the conditions of the climate affect very largely the growth and maturity of the fruit that we may plant or attempt to raise on that soil.

We have as a market for our fruit three very important lines—the canning industry, drying, and Eastern shipping. The canning industry of this State is a large one, and is represented by able men, by good financiers, by gentlemen who are going to post themselves as to the probable supply and demand before the season opens, and they are in a position to understand that better than the average grower. The drying industry is a very large one, and it is in its infancy. It is but a few years ago that there was but little (of what there is now much) first class dried fruits put upon the market in this State. You go back; five or six years ago there was very little sorting; a man dried his good fruit and put it in the same sack as his refuse, but that has got to be changed, for the quality of dried fruit is going to figure as largely in the price realized as any other condition.

The Eastern shipment of fruit has been largely increased within the last five years. Six years ago we had a large crop of fruit, and but a very limited market. The buyers in the market, whether from a canner's standpoint or from a shipper's standpoint, only touched the fruit lightly, took that which they wanted, and left the balance in the hands of the fruit growers, and that was the prime cause of the formation of the California Fruit Union, which was first organized in the fall of 1885, and commenced operations in 1886. I have been the manager of the California Fruit Union for the years that it has been in operation; our shipments have largely increased each year as a rule, and I believe have been much more satisfactory this year than ever before. One reason for it is that our fruit as a rule was good in California this year, and the crop of domestic fruits in the East was very light. We have had as an offset for that—and it has been a very serious one—very poor railroad serv-

ice; in fact, I believe I may safely say that the California Fruit Union has not shipped a single car in four months that has been delivered to its point of destination on the expedited or schedule time. Such has not been the case in years past; the number of cars that have failed to reach the destined point in about the expedited time has been small, whereas this year the cars that have arrived on time have been the exception. I believe that in the year 1889, out of twenty odd special trains that we dispatched from Sacramento—when I say “we” I mean the California Fruit Union; I do not refer to any other outside organization, because I do not know anything about their business—of these twenty odd trains in 1889, there was but one that was not delivered on time in Chicago and equivalent points. In the year 1890 out of about the same number of trains there were but three that were delivered on time; and had it not been that California fruit, in even moderately poor condition, sold for a good price in the East, this year, owing to the almost absolute scarcity of fruit in the East, it would have been one of the most disastrous years that we have ever had. I do not mean to imply by that the drying and canning industries, I am meaning the Eastern shipments; but the high price that canners were forced to pay for fruit here and the expected high price that dried fruit would bring, have made the receipts of the California fruit grower large this year, although the crop has been rather under the average. Some have said that they thought the crop was a small one this year. I do not agree with them. I believe that California raised more fruit this year than ever before. While there has been quite a loss of trees in many localities, I believe that the additional age and size of trees in bearing this year have fully made up for the loss and for the short crop in some localities.

Now, then, how to dispose in a profitable manner of this fruit is what interests every fruit grower in the State; and I believe that one of the things that is a move in the right direction, is the formation of local organizations of some kind. This enables a man to ship five, ten, or fifty boxes to points where he could not do it when he had to work alone; in fact, a dozen or twenty men in a locality, although they be small fruit growers, can do that which they could not do if working independently. And besides that, there are many advantages in local organizations. You can have a little fund for experiment; you can have a little fund to pay for information, and you can, with a little money, either by sending an accredited agent to the East, or to other localities in this State, ascertain what is done in other sections. The sections of the State that have shipped largely to the East are limited, and the number of growers that have shipped is limited, and I believe there are not many of them living in Santa Cruz County. We have a little settlement up here in the Santa Cruz Mountains that has for several years shipped quite a number of cars of grapes, and usually with good results. Santa Clara County is one of the largest fruit-growing counties of this State, but you can count on the fingers of your two hands those that have shipped very largely from that county. Sacramento County has shipped considerable. The mountain counties, especially Placer, have shipped largely, as has Solano. Solano County has probably shipped more than any county to Eastern markets.

Now, of the kinds of fruit to ship, I will say this: Almost any fruit except black grapes will ship to Eastern markets to good advantage, if not shipped too largely, and if they get them there at the right time

Solano being one of the earliest localities in the State, the early shipments from there have always been remunerative. The apricot has not been shipped largely, from the fact that the people of the East have not been educated to the eating of the apricot, and further, the apricot does not, like many other kinds of fruit, improve by being picked green and ripened en route. The shipments of apricots have been largely increased and the market extended, and markets that two or three years ago would take apricots sparingly have this year taken quite liberal supplies at fair prices.

I ought to have spoken of the cherry, that being the first. The cherry shipments have been very largely made from Alameda and Santa Clara Counties, the first going from Solano and Placer; but the prices that they usually bring, at the time that the cherries ripen in those localities, hardly justify large shipments. I think this year the Union shipped three or four cars from Solano and Placer Counties before there were any shipments made from Santa Clara and Alameda Counties, and I think that there must have been in the neighborhood of fifteen carloads shipped from those two counties, some of them with disastrous results, others very fine. It requires considerable experience (and that is usually best gained by your own efforts) to put up such a delicate fruit as the cherry and ship it on a trip that takes one week or thereabouts to arrive at its point of destination. Some of the best ventures that have been made this year were made on cherries. There were two or three cars that made more money to the shipper than any other cars that were shipped by those parties, and at the same time that that was true, they had previously sent some that were disastrous and caused them very heavy losses.

The peach has always been a desirable fruit to ship, and has always made a ready sale in all the Eastern markets, except when coming in competition with a large and full supply of domestic peaches there. All of the early peaches that have been shipped from California the last five years have, as a rule, paid well. Some of the intermediate peaches have not done as well, coming in conflict with liberal supplies of domestic fruit. Extremely late peaches have usually sold well. In picking and packing the peach there is a great deal of judgment required. The fruit should be as well matured as possible and still be perfectly firm, for if too green it does not carry any better than if too ripe, and consequently arrives there in much poorer condition for eating than does the peach that is a little overripe, and of which there may be some in the box. I have seen several gentlemen that were in the East this year who expressed a great surprise that fruit, and especially peaches, brought the price that they did in the Eastern markets, considering the condition of arrival. They said that a box of peaches half rotten even sold for \$1 or \$1 50. The service that we have had and the delays have made much of our fruit arrive there in poor condition.

The pear in nearly all varieties is a safe shipper, and if shipped at the right time usually carries fairly well and arrives there in good condition. Of course the Bartlett pear is shipped from here during the extreme hot weather, and some of them are scalded in the car on arrival. Those, of course, are in bad condition.

Our grape shipments this year have been very heavy indeed, and have not met with as profitable sales as in some other years, from the reason that our crop was a very heavy one here and met an equally heavy one in the East; still, taking the magnitude of the shipments

and the delay that they suffered in transit, I think that we may safely say that the shipments paid fairly well.

DISCUSSION ON FRUIT SHIPMENTS.

QUESTION: How about the prune and the plum?

MR. BUCK: They paid in the early part of the season extremely well. In fact, all California plums, ever since I have had the management of the California Fruit Union, have paid, I think, as well as anything that has been shipped, and especially is that true of the colored varieties; white varieties are not wanted except in very limited quantities. Two years ago I was East during the fruit season, and I understand that that is more than true now; from what I say it will be seen that California fruit is not only a luxury, but a necessity. The fruit dealers there require the California fruit to dress up their stands and make them attractive, and it is there shown that fruit should be of fine size and high color, and that is one of the things that makes its value there. It is sold almost entirely upon appearance.

MR. BERWICK: Will you state the most desirable kind of each fruit for Eastern shipments?

MR. BUCK: I think of the apricot, that the Royal is the best. The cherry, of course you commence with the early varieties, and if they carry well they are worth more than the better varieties that come later, and that is true of all kinds of fruits. The Black Tartarian, Royal Ann, Napoleon Bigarreau, and Black Republican are the main varieties shipped.

MR. ADAMS: You speak of some shipments of cherries being disastrous and some profitable. To what do you attribute this—the packing?

MR. BUCK: No; the same party packed them; but we had a rain about the first of May, and I think the shipments made immediately after that rain were disastrous.

MR. ADAMS: Then that must have been the packing, because they sent fruit made unfit for shipment by rain.

MR. BUCK: A great many times it is impossible to discern whether fruit will ship or not until it has been picked two or three days. That is the case often with grapes. Grapes may be burned so they are absolutely worthless, and if packed during the hot spell or immediately after, before they have had time to wither, you can hardly tell that they were spoiled for packing.

MR. BERWICK: Will you inform us as to varieties?

MR. BUCK: Of peaches, the Crawford's are the best, early and late. Commencing with the early varieties, the Alexander I is probably one of the best, and Hale's Early, Early Crawford, and Late Crawford.

Q. Early Beatrice—how is that?

MR. BUCK: I would not plant any of them. Following on is the Susquehanna, Orange and Lemon Clings, George's Late, and Salway are the principal varieties that are shipped.

MR. MOSHER: I would like to ask if Mary's Choice peach is a good shipper?

MR. BUCK: It is a good shipper. There are several varieties of peaches that are not very commonly raised, among them Mary's Choice, which

is a good shipping peach. It is very similar to the Crawford, of the Crawford family, and all of the Crawford family seem to be better keepers than most any peach raised. Reeve's Favorite is another one of about the same character, high colored and good flavored.

MR. THOMAS: How is it with Seller's Freestone?

MR. BUCK: I do not know the peach. Seller's Orange Cling is a good one; but a white peach, as a rule, is not a good shipping peach to any market. A high-colored yellow peach will sell much more readily than a white peach.

Q. How about the Foster?

MR. BUCK: The Foster is not as good a shipping peach as the Crawford. It is a good peach to raise for drying or canning purposes, but I do not consider it as good for shipping as the Crawford.

Q. I would like to inquire if it is necessary to have a great quantity of one variety in order to ship?

MR. BUCK: The greater variety you can have in a car the better it sells, as a rule. That is the object of different parties in a community loading a car.

MR. MOSHER: Are there many Muir peaches shipped?

MR. BUCK: Very few shipped, because they are a desirable canning peach, and canners have pretty much used them up, and I do not believe that the Muir would be as good to ship as some others, for the reason that it lacks color on the outside more than some other peaches do.

MR. BERWICK: Figs—what about them for shipment?

MR. BUCK: I would eat them here, because you would probably have your boxes and not many figs when they got there. Of grapes, some of the best sales that have been made were of the Early Chasselas variety; but it is only in limited quantities and from the earliest sections of the State that it would be advisable to ship the Chasselas; then come the Muscat and Tokay, which are the principal ones. The Emperor is a good shipper and good selling grape after the others are partly gone. The Emperor will not sell when brought in competition with the Muscat and Tokay.

MR. BERWICK: The pear?

MR. BUCK: Well, almost any pear, still the Bartlett is the principal one; then Beurré Hardy, Beurré Clairgeau, and Doyenne du Comice.

MR. BERWICK: What is the prospect for apples this year?

MR. BUCK: They are reported to be very light in the East; in fact, I know they must be, because I see by the quotations that they were selling for from \$4 50 to \$5 50 a barrel in New York only a few days ago, which is an extremely high price.

Q. How about the nectarine?

MR. BUCK: Well, a few high-colored nectarines sell high, but the nectarine as a rule is a delicate fruit, and the white varieties very seldom arrive there in good condition.

Q. As to the plum or prune?

MR. BUCK: Well, any of the early high-colored plums sell well.

Q. The Tragedy?

MR. BUCK: The Tragedy sells very high in the East.

Q. The Tuscan Cling peach—is that good?

MR. BUCK: I should rather can than ship them. To look at the Tuscan Cling you would judge that it ought to be a good shipper. The

shipments that have been made of it as a rule arrived poorly or sold poorly.

Q. How about the Vernal grape?

MR. BUCK: Well, the Vernal is something like the Emperor, it sells all right when there is not any other grape, but the Vernal is not a high-flavored grape. While it is a nice looking grape, it has not sold as well this fall as other grapes that have been shipped at the same time.

MR. STOREY: They say the bunches break off; how does that affect the product?

MR. BUCK: If a grape breaks loose from the stem in transit it is almost sure to decay; any variety of grape that breaks from the stem by handling or shipping arrives in the East in a bad condition.

Q. What has been your experience with the Japan plum?

MR. BUCK: It has generally sold for about from half to two thirds the price of good colored plums at the same time.

Q. Are Royal Hative plums good for shipment?

MR. BUCK: Yes, sir.

Q. How about the Columbia?

MR. BUCK: The Columbia is a good plum and sells well.

Q. How about the Silver prune?

MR. BUCK: A few Silver prunes will sell well, but if there are very many over there they will not sell. The same thing is true of all white plums; a few packages in a car will sell for more than the colored plums, but you put in a carload of white plums and a carload of colored plums at the same time in any market, and the colored plums will outsell the white 50 per cent certainly, if not 100 per cent.

Q. How about the Japanese persimmon?

MR. BUCK: There is a gentleman here who can give you absolute experience. Mr. Cooper has already shipped or started two carloads East this year. Those that he shipped in the past I know but little about.

MRS. McCANN: Has any one tried the Marianna plum?

MR. BUCK: I do not know it.

MRS. McCANN: It is a new one, for which they claim very great shipping qualities and an immense bearer. It is a new plum advertised by the Eastern growers as being very early and a very dark plum.

Q. What has been your experience in raising early vegetables and shipping them to the Eastern market?

MR. BUCK: There has been next to none from this part of the State. They get them from the Southern States as early or earlier than we do. None were shipped to the East from Vacaville to my knowledge.

Q. What would be the demand for early tomatoes in the Eastern markets?

MR. BUCK: They get them from the Southern States earlier than they can get them from here. If you get them early enough the demand will be good. The first come from the Bermuda Islands, followed by shipments from the Southern States.

Q. What is the difference between fruit that is thoroughly watered in the summer time and that which depends altogether upon cultivation?

MR. BUCK: The non-irrigated fruit has always shipped far better than the irrigated fruit.

MR. THOMAS: For the last three years I have been experimenting with the apricot plum (*Prunus simoni*). This year I have found it good for three weeks' shipment. It is a fruit that will ripen in transit

and come out a beautiful red color, and I think it will be a fine fruit for shipping.

FRUIT PREPARATION.

By J. L. MOSHER, of San José.

The standard of our fruits as they are prepared for market is the important part of horticulture that first of all should not be neglected. We must not carry the idea that we have gained perfection; that there is only one way, and that we have all learned it, and that we have only to turn the handle and the work is done. The curing and preparation of fruits in this State is comparatively a new industry, and if we could look into the future, I believe we would all be very much surprised to see how much we have yet to learn. At the coming World's Fair nearly all nations will strive to excel in the preparation of their fruits, and California must not be lacking. France, with her ages of experience, will show us some excellent and astonishing productions. Florida and other States, although they seem to be quiet, will be there; but California, with her "go ahead" people, will not be satisfied unless we lead the world with the display of our fruits. The past season has forced upon us the knowledge that the curing and preparing of fruits is of as much, if not more importance, than the growing of them. I understand that there have been more than thirty carloads of prunes rejected by reason of improper preparation, and the bulk of these prunes, I understand, was from old, experienced driers. This goes to show that perfection has not been attained. I believe that in the next few years we will see many changes in the manipulation, and less expensive processes in the disposing of our fruits, and that we will have better processes, and thereby better fruits.

DISCUSSION ON FRUIT PREPARATION.

MR. ADAMS: I understand you to say that about thirty carloads of prunes were rejected. Can you tell us just exactly what was the matter with them?

MR. MOSHER: They were improperly cured. I think, as nearly as I could learn, that they were not exposed to the sun long enough—not dry enough; possibly some of them were slightly mildewed, caused by rain. I believe that the masses of the people are ignorant of the standard of some of our dried fruits; for instance, we take the peach, if we take the fully ripe peach properly prepared, when it is properly cooked it will be equal to, if not excel, the ordinary grades of canned goods. Now, in this I do not wish to be understood as depreciating our canned goods, but endeavoring to lift up the standard of our dried fruit. We know it will take from seven to ten pounds, according to the kind of peaches, to make one of dried fruit, and as near as I can learn, that same amount would make about half a dozen cans of fruit, selling from 25 to possibly 30 cents a can, bringing in the neighborhood of \$1 50 or \$1 75. We do not consider that a high price, but if we get one fourth of that, if we get 40 cents for our best dried fruit, it is considered exorbitant.

MR. ROGERS: My method of curing prunes is similar to that commonly used in the Santa Clara Valley. Pick them when they are ripe, dip them in a solution of lye—it is pretty hard to give the strength. When I start with my fifty-gallon kettle, I put in five pounds of lye; and when it is not strong enough I put in another can—I keep them as near to that as I can. I rinse them in cold water—I am very careful that they are clean—and put them on trays. I grade them before I put them up. I leave them in the sun until I think they are dry enough to come in; then bring them in and throw them on the floor in the fruit house. I do not mean to pile them very deep, for I do not believe it is a good plan, but sometimes I have to. Sometimes those at the bottom, if they are not exactly cured, are liable to spoil. I leave them there until I am ready to pack them and ship them away. If I put them in boxes I dip them again, for possibly some moths have laid eggs on them, and they are liable to be wormy if I do not dip them again. Hot water is a good dip; put a little salt in it. Some use glycerine and some glucose.

QUESTION: How much glycerine?

MR. ROGERS: That is a question of choice—some a pound to fifty gallons, some two pounds. I suppose it will stand four pounds without tasting it. I never used as strong a solution as that; I have been told it is used. After you have dipped a great quantity of prunes you have a prune syrup in your dipper that gives the prunes a nice appearance; tends to give them this French appearance.

Q. How long do your prunes sweat?

MR. ROGERS: Until I get ready to pack them; sometimes two weeks, sometimes two months; they are always in condition. I have never been in a hurry to pack; I wait until I get through drying.

Q. Do you prefer packing them in boxes?

MR. ROGERS: I have packed but very little; this is the first year I have boxed any to amount to anything. I should judge that the finer varieties, that is, the larger ones, would pay best in boxes. I would not advise any one to pack small prunes in boxes.

Q. Have you had any trouble in some of the prunes not checking properly in the lye?

MR. ROGERS: Yes; you cannot overcome it; that is to say, there will be some of the prunes when you dip them into the lye that will show the cracks, and others won't show any effect; but, nevertheless, the lye has affected them.

Q. How do you tell when the prune is properly dried?

MR. ROGERS: I feel it. That only comes by experience. It is pretty hard to tell a man how they feel; if I had one here I could tell whether it was cured or not.

Q. Do they dry the prune until the stone comes out clean?

MR. ROGERS: I have never used that test; they say it is a very good one.

Q. When you pack prunes do you throw out those that are not dry enough?

MR. ROGERS: I have had to do that this year; pick out some very soft ones, those that did not seem to cut.

Q. How about the insects?

MR. ROGERS: As I say, the eggs are laid by the moths when they are on the trays, and after awhile the eggs hatch and the worm grows

but if you leave them there a long while, where there is a good deal of pressure, they are not very liable to get wormy in the center of the pile.

MR. McLAUGHLIN: I had some in boxes and I stored them away for a month or two, and when I came to get them to ship, to send them to town, they were maggoty, and I never knew the cause of it, and I thought all prunes probably got maggoty when they were put away in a pile.

MR. ROGERS: If the gentleman had had them in one big pile they would not have got in that condition, but he had them in small boxes, and there was no pressure on them.

MR. MORRELL, of Wrights: I have had a good deal of experience in prune drying during the last fifteen years. My ranch is on the Santa Cruz Mountains; and I can't use a sled, so I shake them onto the ground, pick them up, grade them, dip them in a solution of lye, and put them on trays to dry. In my climate they dry in from five to ten days; I take them up, put them in bins and let them sweat, and afterwards dip them in boiling water with about five pounds of salt to fifty gallons of water, and then sack or box them.

MR. BERWICK: How long do they stay in the lye?

MR. MORRELL: From five to ten seconds. My kettle holds about ninety gallons, and I put in about six cans of lye to start with and add more as I fill it up with water. We have no method that I know of to test the quality of the lye.

MR. AIKEN: How do you tell when a prune is dry enough? Have you any test?

MR. MORRELL: When they will rattle on the boards is as good a test as I know of. The prune should not be picked from the tree at all; when ripe enough to leave the stem on the tree it is sufficiently ripe to dry; they will shake off easily from the stem.

Q. What brand of lye do you use?

MR. MORRELL: The best American concentrated lye.

MR. ROGERS: I will state that I have used this year the lye known as "Champion, 98 per cent." It is a powdered lye. With the American lye it don't seem to be all of the same strength. This Champion lye is excellent.

MR. ALLEN: This is one of the things that those who have had experience know they never can do by rule. As to the quantity of lye to use you must consider the state of ripeness, whether the trees have been irrigated or not, and other conditions. There must be always behind good fruit growing a trained eye and a cultivated mind, just as the fingers are practiced to tell whether the fruit is dry enough. You put your hand up to a bin of fruit, and your finger will detect every one that is not dry enough; if you have not the skilled finger, you have got to tell by observation. We do just as Mr. Morrell says: we put six or seven cans of lye into a ninety-gallon kettle; after you have dipped a ton in there is more or less sugar that has gone off of the fruit into your lye, and your lye begins to get ropy—it is sugary—it will not cut as well as it would before it had the saccharine matter in it; now you have got to put in a couple more cans, and when you put your dipper in and take your prunes out, your eye will tell you at a glance whether it is right or not; you have to learn it by experience. There are a great many things that come by brute strength and awkwardness; you have got to find it out by doing it. It is just the same with lye; nobody can give a rule. This

gentleman asked about cutting your fruit. If you grow good prunes, have them thrifty and well grown; they will all cut. If they have begun to wither a little, or your trees are drying up, they won't cut if you put in ten times as much lye; they are thick-skinned and puffed up; but if your land is well drained they will come out all right. You cannot give rules for all these things; you have got to get it in a general way, from trained observation that tells when you are right.

MR. MOSHER: First of all, it is very necessary to grade our fruit; that is one of the most important things to consider, unless it is the ripeness; we must get our prunes just as ripe as we possibly can. We begin, then, on a rich, black prune. As to the dipping, my experience is a little different from what has been mentioned here. I tried it in all shapes and ways, with all strengths of lye and without lye, and I find that the cutting depends more on the heat of your water. This season I thought I would dip my prunes in water or lye, heated by a stove, but I could not get the desired result that way. Now I heat my lye with steam, and get it very hot. I can take hot water and cut prunes, but I consider the lye an advantage, because it reduces the thickness of the skin and also assists, probably, in cutting the fruit. Another way I have practiced and found very advantageous: Before my prunes are entirely dry I put them in bins—when probably two thirds dry—and allow them to heat, but not long enough to spoil. I shovel them over probably every day, or every other day, and they heat and close. Then I take them out and put them on trays very deep, putting on one tray about as much fruit as I would ordinarily put on six, and then put them out in the sun. They don't dry too fast nor get hard, but are very pliable. After they are dipped I put them in bins. I have an apparatus with a hanger overhead; I have my bins in a row, and dip one hundred and fifty pounds at a time. We run them right along, and by having an extra rope we tip them out. One man does the work where otherwise it would take six. When in these bins, I watch them very closely to see that they do not become overheated, and when they get very soft and pliable we turn them over; we let them sweat again and watch them probably two days before we shovel them back again. I have had them lie in the bins this summer six or seven weeks.

MR. ROGERS: I would like to ask Mr. Mosher if he dips his prunes in this lye solution when it is boiling?

MR. MOSHER: Yes, sir.

MR. ROGERS: You consider that the best way?

MR. MOSHER: Yes, sir. We put them down quickly and bring them right out; as soon as they come out you can see right away whether they are cut properly or not.

MR. ROGERS: Do you find that those prunes that are dipped in the boiling solution dry better and more evenly than when the solution is just under the boiling point, say 205 instead of 212 degrees?

MR. MOSHER: We are not so very particular about that. The solution is boiling, and when you put in one hundred and fifty pounds of prunes that will reduce the temperature a good deal.

MR. ROGERS: I find in dipping into boiling water that it scalds the prunes and they do not dry well.

MR. MOSHER: There is another point I think is excellent; that is, after I have dipped my prunes into lye I dip them into a tub of cold running water, and then dip them into another tub, and then I have

another large tub with a steam pipe, with water not very hot—that is, not boiling. After they go through these two waters I dip them into this hot water again and leave them there until I know they are pretty well heated; then I put them on the tray. We roll them on the tray just as hot as you can roll them with your hands. I claim that we can gain thereby probably one or perhaps two days in drying, otherwise if you put the prunes out on a tray, say at ten o'clock in the morning, it will be twelve or one o'clock before they warm up; but if you put them into hot water and put them out hot, they are already heated and go right on drying. I don't know but that it is preservative, too. In September we had quite a heavy rain, and I had a good many prunes out; some of my neighbors had some prunes out that got a little moldy, but I had but little trouble that way.

FRUITS IN THE EASTERN MARKET.

By C. H. ALLEN, of San José.

I accepted the position of Superintendent of "California on Wheels" chiefly in the interest of fruit growing. I wanted to know something of what our fruits were doing East, and I will briefly give you the result of some of my observations. I joined the exhibit train in northern Wisconsin, and at the various places we visited I got leave of absence and visited the fruit dealers in the locality, particularly those who were wholesale dealers, where the place was large enough, and inquired of them what fruit they were selling, where they got it, what prices they realized, what their criticisms were, if any, upon California fruits. I made it a point in each place to get as much detailed information as I could of that kind. This side of Chicago our fruit, in most of the places I visited, was well known, and the market price and the sale of the fruit seemed to be satisfactory, and, as Mr. Buck very tersely stated, the sale is immensely increasing—the world is very large; I came to that conclusion after going over there and seeing the amount of fruit that is wanted, and the demand that is coming on, and will continue to come, and I came back with no fear of overproduction. I had had some fears of overproduction, but I am satisfied now that there is no danger of that.

When I got east of Chicago I found it considerably different; our fruit is almost an unknown quantity to the consumer in intermediate places east of Chicago. We went down on the Baltimore and Ohio, stopping at all the little hamlets and towns of five, and twelve, and fifteen thousand, and very few there knew California fruit; I mean our dried fruit. They knew something of our green fruits. I would say that I found the green fruits on fruit-stands everywhere in all those little towns not of the best quality, but a vast amount of it sold, such as I had hardly expected. There were a dozen fruit-stands in every town covered with California fruit, but the dried fruit in most of them was almost an unknown quantity. They would come through the car, and look at our samples of dried fruit—no better than we have below here; no better dried fruit in the car than we are exhibiting here, and putting up all over the State—and would come back to me and say: "Where can we get that kind of fruit? We have never seen anything

of the kind." Not by ones, or twos, or scores even, but by the hundreds. "Why don't you people get your fruit out here." I found that all the way, say, after we left Pullman, east of Chicago. At every little place that was the cry all the way through, and until we got into Wheeling and Pittsburg, where I left the train. In Pittsburg, which I believe is the greatest dried fruit market in the world, from reasons that a gentleman gave me there; he said: "They are all mechanics; your dried fruit does not sell to bankers and merchants, and that class, because they can afford to buy your canned and fresh fruits. It does not sell to the farmer, because they raise a little fruit of their own, but here we are all mechanics, as a whole, from Wheeling clear through to Pittsburg, and live on dried fruit, and here is where your market is, and we are anxious to learn all that can be learned of your fruit, and to know where it can be had, and where we can get such qualities as you are exhibiting here."

I found, as I suppose one might expect to find, knowing the peculiarities of human nature, a good deal of fruit sold as California fruit that was never nearer California than Chicago. I found some exceedingly inferior fruit marked "California Dried Fruit." I went into one large and thriving city and went to a wholesale dealer, and in my ordinary way gave him my card and told him what I was doing—and I want to say that we were made very welcome everywhere; they didn't look upon us as drummers at all, but they wanted information; they were anxious to learn. I asked him: "What fruit are you selling from California?" He said: "We can't sell California fruit, it is poor stuff; I have got a hundred boxes upstairs, and they bring it back." I said: "May I ask permission to look at the fruit?" "Yes," he said, and he went up with me to the loft, called his man in charge, and took down some boxes marked "California Spanish Prunes." I said: "That is an unknown term so far as I know; I know California pretty well, but I do not know any Spanish prunes; will you have your man open one of these boxes?" He opened the boxes, and they were, I should judge from appearance, dried Damson plums, all bone except a little skin drawn over them. I could not see that anybody would ever buy anything of that kind if they had tried it once. He had a hundred boxes of those prunes that had been sold to him for California fruit. I found that duplicated in a number of places where I looked at the fruit, and knew that it had never come from here.

MR. ADAMS: Is that distributed by any well known dealer in California fruits?

MR. ALLEN: It had a name on the outside of the box that I am familiar with.

MR. ADAMS: What was it? I think we are entitled to the information. Whose name was on the box?

MR. ALLEN: The man who bought it can give it to you. No, gentlemen, I should be sorry to believe that the brand on the outside of those boxes was put on by the men who deal in that fruit. I believe it was a forgery. I do not believe that Porter Brothers sold fruit that was never raised here and palmed it off for California fruit. I do not believe they did it, and yet their name was there, and I give it with that statement because I know the gentlemen. I believe that the forgery occurred farther East than that. I believe there is where they are put up, and that the fruit is sold all the way through there in that way, spoiling our

trade, for anybody who would get one of those boxes would never want any more California fruit. It seems to me that there should be some way that we could secure a guarantee that our fruit is genuine, because such practices are largely injuring the trade not only in our dried fruit but in our green fruit. They have constantly sold there an Egg plum for the Silver prune. I found boxes packed by a drier and marked "Egg Prunes," and they were selling them as a sweet prune. I asked a gentleman: "How does the Silver prune sell?" He said: "It is so sour that no body wants it." I said: "The Silver prune is a sweet prune." He said: "Oh, no; it is the sourest thing you ever tasted." He had bought a large quantity of dried Egg plums which were sour enough to suit anybody, and bought them as Silver prunes, and supposed he was dealing in Silver prunes. That sort of thing is spoiling the demand for California fruit. They do not know what our fruit is, and if in some way we could remedy those things, get this fruit that is well prepared and is suitable for table, and could put it on the market and in some manner suppress the other, we could not do a better thing for our California fruit industry. Whether this organization can do anything of that kind I do not know, but I feel very much interested; I felt indignant that we were thus swindled, that we were having palmed off as our California fruit, fruit that was neither grown nor prepared here, and I could see that it was working an injury, so that for years there will be no demand for California fruit in such places.

MR. ADAMS: Do you think that that evil of adulteration or fraudulent practice is sufficiently extensive to call for any expression of opinion or any action from any horticultural body in this State, or is it merely a trifling matter which occurred in one or two instances?

MR. ALLEN: It was pretty widespread. I will give this as a suggestion, and perhaps a wiser man can work it out. It seems to me if there could be a little pamphlet prepared, giving an accurate description of the various brands, not personal brands now, but kinds of fruit; that the dried Prune d'Agén was so and so in appearance, tasted so and so; the Silver prune was so and so, and the Egg plum, and so on; a general description of our dried fruits, with or without cuts, and I do not think cuts would be necessary. If that could be generally distributed throughout the East it would help to mitigate the trouble. They seem to be exceedingly anxious, particularly the wholesale dealers there in Pittsburg, to get into closer connection with the grower. "We do not want to go through all this manipulation; why don't you have some organization there, so that we can buy from responsible organizations in your State, and buy direct, and not through the brokers and middlemen?" They say: "Of course we can't buy from individual growers, we don't know you." I returned the compliment and said: "We do not know you." "No," he said, "but you can go to 'Dunn's Commercial Register,' and you can find out all about us, and we can't find out anything about you. If we buy of you, we have no guarantee at all. If you can get any organization to give us any guarantee that we can buy direct your California fruit, you will get our trade." That is one point that may work.

MR. ADAMS: I would like to ask Mr. Allen if he thinks they scratch off the names on the boxes?

MR. ALLEN: I found boxes that obviously had every trace taken off that was put on by the grower; and nothing that we grow, nothing that

my friend Mr. Morrell grows, nothing of that kind that we have supposed was getting a little reputation there, had any name or any traces of any on. They do not know where they come from. All that I found east of Chicago had the name removed, and a new stamp put on. I had vainly hoped we would get a little reputation, but there was not anything of that. It was not so in Chicago; I attended the fruit sales in Chicago, and I found Mr. Buck's and Mr. Block's fruit sold green with their stamp on; but when we got east of there the dried fruit is not so sold—it is with the name of the broker.

MR. CLAFLIN: I wish to state on this subject, that the orange growers of Riverside have endeavored to solve this problem in this way, by organizing a fruit growers' association, adopting a trademark, having it registered, and having the trademark placed in such a way that when it is placed upon a package the package cannot be opened without disturbing the trademark. On that trademark is a statement of the place where the fruit is raised and packed, so that any person buying packages with that trademark on will have the guarantee that it is raised and packed there. With that trademark, which is established under the signature and authority of the Board of Trade, guaranteeing the reliability of the fruit which it covers, it seems to me that that might be done in any place.

MR. ADAMS: I believe from what Professor Allen has told me at other times, that it is one of the most important subjects that could engage the attention of the fruit growers here, and I am utterly opposed to bringing up these things and talking about them without trying to do something, and I move that a committee of three be appointed to consider this subject and report thereon.

Adopted.

COMMITTEE.

President Cooper appointed E. F. Adams, D. M. Locke, and Geo. Hussmann.

COMMITTEE ON EXHIBITS.

The following were appointed to examine the exhibits, and on resolutions: H. C. Dillon, of Long Beach; Fred. C. Miles, of Penryn; G. E. Mitchell, of Pomona; R. C. Kells, of Yuba City, and H. Hamilton, of Orange.

Recess was then taken till 2 o'clock P. M.

AFTERNOON SESSION.

President COOPER in the chair.

PRUNING.

By R. C. Kells, of Yuba City.

I am a thorough advocate of pruning. You can refer to some of our oldest growers in the State, Senator Buck, A. T. Hatch, W. W. Smith, General Bidwell, Thomas Garey, and others throughout the State, and you can get their ideas of pruning and yet not know how to prune until

you have had some practical experience. The subject has been taken up here, since this Convention has met, as to the style of pruning. I, for one, advocate low pruning. I had an essay on the subject of pruning at the Sacramento Convention in 1885, and I still hold to the same points I tried to explain at that time. Low pruning was considered by a great many as objectionable on account of cultivation. We have at the present time appliances so that we can cultivate by horse-power and get as close to our trees as we can with high pruning, and in fact I think we can get closer to the trees and do more thorough work with less injury to the trees than we can with high pruning. For instance, a man wants to prune his trees high; what he calls high pruning would be a five or six-foot body perhaps, or we will say four feet; when he tries to plow close to that tree, which he will endeavor to do, he is going to injure the limbs and tear the branches off a great deal worse than when he is plowing a tree that is well pruned and simply rub the outer branches or limbs, which will give way either to the harness or to the plow. A great point in favor of low pruning is that we thereby save a great expense in gathering our fruit, and we can balance our trees much easier by low pruning; we can shape them so that if they are inclined to lean too much one way we can cut off some of the lower branches and straighten the trees. The expense of gathering fruit with step-ladders from high-pruned trees is enormous; a man cannot gather one fourth as much fruit from a high ladder as he can from the ground. I have not any particular point that might be new to fruit growers that I think of to bring before this Convention. I simply mention these points so as to bring about a general discussion of the matter.

DISCUSSION ON PRUNING.

MR. COOPER: I would like to inquire what the gentleman (Mr. Kells) calls "low" pruning and "high" pruning?

MR. Kells: Six years ago we set out an orchard of eighty acres; we cut our trees as they came from the nursery back to an average of twelve or fifteen inches in height, cutting close to a bud, so that we would not have too much of a dry snag left after the tree began to grow; that made the bodies not over a foot or fifteen inches in height, and the buds start at about that height. All young orchards that have been put out in our neighborhood since then have been pruned pretty much after that fashion. That is what we call low pruning in starting a tree. We believe in thorough pruning back the first two or three years, cutting back fully one half or two thirds of the first year's growth after planting, following the second year by cutting back to one third of the second year's growth. Mr. W. W. Smith has laid down plans for pruning at different times before this Convention, and has laid out in his manner of pruning a very careful system, but I do not think that there is any one who can follow any particular plan of that kind and make pruning successful by trying to keep his trees in uniform shape.

MR. COOPER: I would like to inquire of Mr. Kells what season of the year we should prune trees?

MR. Kells: I will state that we begin pruning in the Sacramento Valley as soon as we can get at it after the leaves are off. We are pruning apricots now in our locality.

MR. ADAMS: I notice in the Santa Clara Valley they commence pruning as soon as they get the fruit out of the way, while the leaves are still on as thick as ever, and before they begin to turn at all. I will inquire whether the gentleman knows of any objection to that practice?

MR. KELLS: I do not, so far as I am concerned, except that it is a little more expensive. I think you cannot make as much speed in pruning when the leaves are on as you can when they are shed.

MR. HALL: In some sections they prune the trees in June, when they are growing. I would like to hear about that.

MR. KELLS: I would call that "summer" pruning. My experience in summer pruning is not very satisfactory. Our trees produce so many new laterals and branches that we think we are making too much of a broom-shaped concern to the tree—too many clusters coming together—so we do not think summer pruning is advantageous in our section.

MR. ADAMS: I was going to say this: A tree from either striking a poor stratum of soil, or some injury to the root, or from some cause, fails or has very little growth; now, for the purpose of starting and producing new wood, is there any objection to pruning back into the old wood?

MR. KELLS: None, except you lose your fruit crop if your trees are old enough to bear. If you cut off your old wood you cut off your fruit wood.

MR. ADAMS: What you cut off you lose, but what is left, perhaps, is as much as you desire the tree to bear. I want to know if there is any experience of any injury at all, except the loss of the fruit, where you actually cut off the old wood?

MR. KELLS: I should think that cutting back would be a benefit to some trees.

MR. HALL: I wish to ask the gentleman for information respecting the first pruning of the olive where it is raised from the limb-cutting. As at present advised, I am told to uncover the cutting and cut off all that part of the cutting, except where the root was formed, with a sharp saw, and then tie it up to a post, and so forth. I find that very difficult in operation, and that it disturbs the roots materially and impairs the growth of the tree. If there is any better way I would like to know it.

MR. STEWART: I think there can be no general rule laid down for pruning; a man has to study his tree and his soil and then do it. I know people come to me and say: "Why do you go in for this low pruning and then advocate high pruning?" I used to think that people who advocated high pruning were fools, but a little experience teaches me that they were not; in certain cases they were wise. For instance, prunes I would train low, a low head, eighteen inches to two feet; but if we are to take a walnut or a Newtown Pippin apple I never would think of such a thing. I cut my Bellflowers down that way; now they are in bearing, and what is the consequence? They bear, and this branch goes way down to the ground, then that branch goes down, and scarcely anything is left of my Bellflowers. I didn't understand altogether the question the gentleman wanted to ask.

MR. HALL: For instance, there is an olive cutting eighteen or twenty inches long placed in the ground at an angle of 45 degrees; it begins to sprout from near the upper end; after the root is formed what will you do with the rest of the cutting? I am advised to uncover and cut it off with a sharp saw, and then tie up the sprout to a thick post.

MR. STEWART: I think it would be just as safe to leave it. My prin-

cipal object in olive planting is, first of all, to get a good root above everything else; let all suckers grow the first year; afterwards, if the tree has grown well, prune it to one branch, cut off the top and let it form a head.

MR. BUCK: I would agree with Mr. Kells in nearly everything he has said. I consider low pruning advantageous, in our section decidedly so, and unless absolutely obliged to, on account of too heavy a growth in summer and breaking by wind in the fall on young prunes, I never would summer prune. I would hardly go as low as Mr. Kells said, though I would cut them about twenty inches from the ground, which I call low pruning. I think it is more advantageous; you get a better shaped tree, easier handled, and I believe just as easily worked. Now, in reference to the apple tree, I presume the gentleman is correct; that high pruning would be better for apples than low pruning; that the body should probably be higher; but for a peach, or an apricot, or a plum, or a prune, I believe that that is more satisfactory in our section, and I would prune the first and the second year so that I would not have the limbs bear down or come down to the ground. I would prune so that I would have a strong, heavy fork at the upper end of the body of the tree.

MR. ADAMS: How would you manage that with the Bartlett pear?

MR. BUCK: I would do the same thing with the Bartlett pear, running from the first year one set of shoots higher than the other. A Bartlett pear, of course, grows very straight for the first three or four years, and as they begin to bear they will come out; then after they are bearing to any extent you want to prune the other way; your limbs will come down to the ground after they commence to bear.

MR. ADAMS: Bartlett pears give me more trouble than anything else. I have hardly been able to prune them so that I would not have to cut them off when they begin to bear.

MR. BUCK: We have a great many Bartlett pears, and we prune them but little until they commence to bear, except cutting off the ends of the limbs; then when they commence to bear you have got to prune them up.

MR. ADAMS: I have one more question I would like to ask. So far as I am concerned, I think I know something about the care of trees and the pruning in their younger stages. My own trees are coming to an age where they are beginning to bear and stop that excessive growth. Of course one can go into an orchard and see points that need be removed in any tree; but as I look over my orchard this year, after the bearing of last year, on many of the thrifty, healthy trees I see no occasion to prune at all, except to remove here and there a limb. For any systematic pruning of the whole tree I see no reason, for the growth has not been so great that any fruit that comes upon it is liable to break it down. I wish to inquire whether it is the general practice to keep on with the systematic and regular pruning of the limbs, or whether there is a time when this systematic pruning stops?

MR. McWILLIAMS: I have had some thirty years' experience in pruning, and some time ago there were two expert pruners came to me and said: "We have got certificates from the best orchardists in the State as being professional pruners." I said: "Gentlemen, you are the very men I am not looking for." Later I asked another man if he had ever pruned, and he said: "I have never pruned a tree in my life." And I

said: "You are the man I am looking for." I have experimented a great deal in pruning trees, and I am tired of cutting off all the fruit, and throwing it into the brush pile and burning it. Last year I put out some ninety acres of peaches in Colusa County on rich, fertile soil. In my experience I have never seen a man so poor but what he could always give his rich neighbor ideas how to make money, and I never have seen a man that has ever raised a tree in this country but what he could give good advice in his own estimation as regards how to prune; but on account of our rich soil and our fine climate it will produce a tree, and he claims all the credit for his expert pruning. A man came to me two years ago and said: "You are not pruning your trees enough." I am decidedly in favor of low pruning, especially the peach, and furthermore, I am decidedly in favor of planting the dormant bud; if you want a beautiful peach orchard it will grow out uniformly, and produce trees armed by nature, if you will cultivate your trees in a proper manner. This gentleman came in and said: "Let us try this experiment; I want to cut this row back two thirds." I was cutting them about one fourth. We were right on a row in the center of the peach trees that were not cut at all, and now, sir, those trees that I had not cut at all, except pruning the awkward twisting limbs, are decidedly the finest row of trees I have got in my orchard. I find in my experience that we are pruning entirely too much, both the peach and the prune, and I have left nature to take her course to a great extent to prune those; thin more and prune less, and you will have a finer article of fruit.

MR. HUSSMANN: I believe the whole subject of pruning can be put in a nutshell by saying that the pruner, whatever tree he is to handle, must be a thinking and an observing man; prune a tree just according to its habit; for instance, if a man wants to go into an apple orchard and prune every variety alike, even to a certain height, he will find himself, as Dr. Stewart observes, very much embarrassed after a time. A man must use his judgment and know the variety he has to prune, and the kind of fruit he has to prune; you can come here and talk for hours and days together about pruning, and each one can give his experience, and go back not much wiser than he was before.

MRS. McCANN: Any one who has had much to do with trees has somewhat the experience of this gentleman. It is a very dangerous thing to let a professional pruner loose in your grounds, for the more wood they take off the bigger the job they have before them and the better delighted they seem to be, until I have concluded that I didn't want my trees professionally pruned, and looked for the man that didn't know a single thing about pruning, but to obey me; and then armed with a fishing pole I pointed to the place I wanted cut and said: "Saw there," and around the tips of the trees, where it was thin, I found there would be three buds on a little limb, and if they were all turning that way I watched for the bud that turned this way, and if they were all going that way I trained a dozen buds the other way, cutting just a little above the outgoing bud so as to throw from the single stump a strong limb and balance my tree by nature's plan, and not by propping it up with a fence rail.

MR. CADWELL, of Healdsburg: I have had a good deal of experience in pruning; at first I pruned low on account of being near the coast, and having a good deal of wind I supposed it was necessary in order to

keep the trees in any shape. I have mostly apples, pears, and cherries, but apples I am speaking of more particularly. I used to cut my trees back, and the next year I would have some ten to twenty sprouts to cut off. I came to the conclusion that that was not right, and read every theory I could find until I became perfectly disgusted, and changed the thing around and thought I would try a few trees and let nature take her course. Many trees have died out of the orchard, and I put in young trees and let them grow until they got fully in bearing, probably three years; the second year they bear tolerably well, and the third year the branches bend down with fruit; any one with common sense could prune a tree after that; they will send up shoots that form a wide top and you have a fine tree. Let that tree go on as nature intended. I do not prune at all only the new branches, and to get my horse near the tree I cut it probably three feet high, and then if there is a branch that comes down in the way I cut it off to get under the tree. I have done that for the last twelve or thirteen years, and I have got trees that are over thirty feet high and fifteen feet across, eight or nine years old, and I do not calculate to prune them until it is really necessary, since nature can do a great deal more than I can, and I find it profitable to let nature take her course. I am speaking more particularly of apple and pear trees; my cherry trees get but very little pruning.

MR. JOHNSTON, of Courtland: This question of pruning is one so diversified that it is very difficult indeed for any one person to lay down a rule that can govern all sections and all circumstances. The different localities require different treatment of the trees, so that it is impossible for a State institution of this kind, representing all the people of this beautiful State, to come to any conclusion or establish any definite system for the people all over the State. This discussion has reminded me of a little story. There were five or six ladies who met together and they discussed the question of handling husbands, and they concluded to have an afternoon tea for the purpose of enlightening each other upon the question; so they met, and each one explained the manner in which she handled her husband, and it is needless to say that the experience of those ladies differed as widely as the experience of the gentlemen who have discussed the question of pruning this afternoon; for upon comparing notes they found that each one had a different husband to train. Now, these gentlemen who have so eloquently discussed the question of pruning are from different localities; they have different orchards, different varieties of fruit; some of them plant their trees fifteen or sixteen feet apart, and some of these gentlemen who claim to have these great big apple trees, have them probably forty feet apart; some of them are training peach trees in our hot valleys where they can only raise good peaches, and others are raising pears and apples in the mountains where they can only raise good apples. In order to understand this question you must visit the orchards in your particular locality; go to the successful orchardist in your neighborhood and pattern after him; don't come to the Horticultural Convention where members come from all over the State.

MR. CADWELL: Some remarks were made here in regard to the planting of young trees. Along the coast where I am I did not take the advice of the nurseryman, and I have kept getting older trees, and older trees, till I put out four-year old trees; and the large trees that I speak of were put out four years old in a barley field—just two or three

furrows plowed, and put in—and I have been the most successful that way of any—not wishing to say that I am the only man that is successful, but my nurseryman told me they would not grow at all. The next year I put out four-year old trees, cut them down to three feet, and put a graft in them, and the next year they bore; and I assure you they are as fine trees as you ever saw. But that is no reason why any one else should follow my example, because he might not be successful. However, I am satisfied that we do prune too much. Now, near Santa Rosa, if you take the same plan that they do at Vacaville, you will be like the man that I sold trees to in the early days, who wanted to know the reason why the trees didn't bear. He said that his neighbor's trees were bearing nicely, whom I had sold trees too. I said: "What is the matter?" and he said he didn't know—to come down and see. I went down, and told him that he had cut the fruit buds off—and there are many that do the same thing. There are men around Santa Rosa raising prunes that cut them just the same as they do in other localities, and the consequence is they get no fruit—only a tremendous growth of wood. I am satisfied that they cut too much, and get too much wood. Let nature have a show to form and mature the fruit, and they will bear.

J. M. BENSON, of Elliott: I agree with my friend Mr. McWilliams about dormant buds being as good a tree as you can plant, but they require a great deal of care and attention. A few years ago I planted dormant buds, and also June buds of the peach, and the dormant buds to-day show the best trees, but it is the result of care in growing the trees and keeping close watch, and having a rabbit-tight fence around them. The gentleman speaks of letting nature take her course. If he will visit San Joaquin County and go around that county he will see apricot and peach trees running rampant, and he will want to check them a little bit. I think this is a problem all must solve for themselves. Now, as to prune, almond, pear, and apple, I do not believe in too much cutting; I have some prunes three years old, and when I planted them out I headed them back to twenty inches. The bodies now are two feet high; they stretch, they say; and I got some June buds of the almond from Mr. Hatch (they are very fine trees), and all I intend to do is to cut off the branches in the way of the plow, thin out a little and let them grow. The prune I headed in last winter, and got more sprouts there than you ever saw, but the fittest will survive, and when they get to bearing I think they will stop growing; but as to the peach and apricot I think you have got to head them in, and severely, too; if you do not they will run up into unsightly poles and break down.

MR. BLOCK: I would like to ask when those second quality trees were set out, with the first quality one year old; were they both pruned alike, and how high were they cut from the ground? My experience is, that if you put in a two-year old tree and cut it a little more than you would a one-year old tree—cut them both pretty well, but see to it that the two-year old tree is cut lower—it will do very well. It is possible that insects get in, and also that the borer gets in afterwards. Now, Mr. President, in regard to pruning: You can adopt here no method that will apply to all trees or to all localities; such a thing is impossible. You take, for instance, as an illustration, the Early Crawford peach and the Late Crawford peach; to trim them in the same locality alike I think is a great mistake; and why? The Early Crawford peach makes its fruit

buds at the upper end of the limb; the Late Crawford peach will make its fruit buds from the very bottom up; consequently, if you trim them both alike you will find your mistake. The disposition of the Late Crawford peach is to run away out, and you are going to have a very high tree that will bend down. You can get an equal quantity of fruit from both of them by trimming one higher—the Early Crawford. You have got to see where the fruit buds are. I have seen many professional pruners who did not know the difference between a fruit bud and any other. They have started in to prune an Early Crawford peach and cut away all the fruit buds; or prune a Late Crawford and leave too many, cutting them both alike. A pruner must understand what a fruit bud is, and what is not, and prune accordingly. I believe a great deal in following nature; but you are not going far enough in connection with nature, that is, if you want to follow that practice; you have got to let the cows, the sheep, the deer, and everything else roam in your orchard, and they will assist you in pruning your trees properly. I believe nature has provided for it; that the trees that require pruning probably have leaves that are a little sweeter than the others, so that these animals may prune them better than one of our professional pruners. I had a good deal rather have them than nine tenths of the professional pruners that I know.

MR. CAMPBELL, of Santa Clara: I have eleven or twelve acres of Moorpark apricots; they are shy bearers, and have borne very light crops for two or three years; they seem to be healthy; they have been regularly pruned until within the last two years; no pruning done on them last year at all, but they have had only one good crop in eight years. I would like to get some information as to the reason of that. Another thing I want to ask about is, what are we going to do with the peach borer? It affects every tree that is on peach root.

MR. BUCK: The Moorpark apricot is a shy bearer in very many sections of the State, yet in other sections the Moorpark bears the best of any. I have a few Moorpark trees at Vacaville, and I think in fifteen or sixteen years there was but one crop of any account. One year I had a very heavy crop, and I do not think I ever had as much in all the other fourteen years as I did in that one; so that the Moorpark is almost an absolute failure in our locality. It bears better in Alameda and Santa Clara than in any other part of the State, I think.

MR. HUSSMANN: The peach borer enters just below the collar of the tree, and you see the sap oozing out; the only remedy that I know of is to cut it out, and put some ashes over the collar of the tree. It is very much more troublesome in the East than here, but it is very destructive in some parts of the State. As to the Moorpark apricot, if they were my trees I would graft them over to something better.

MR. MCWILLIAMS: There are two kinds of peach borers that prey upon my trees, though neither one of them is a great disadvantage. There is one that we call the peach moth, that is not like the codlin moth; it eats a little around the stem of the peach, but does not penetrate to any depth. It is not the great terror we expected it would be. This borer does not confine its attacks particularly to the peach, but every kind or variety of wood where the sap ceases to flow. I have seen the worm that produces what is called the "stag" beetle, the largest beetle known, and then it comes down to this worm spoken of. Now, whenever a tree is planted out, if you notice a little bug that is not over half an inch

long, it lays its eggs in the shell of the bark of the tree, and then when it hatches out it commences its work, and whenever it comes in contact with the sap that is freely flowing it stops; but if the tree is a little sunburned on that side it will continue on that side and travel up and down, and finally make its winter quarters in the center of the tree; then he has done his work, and you need not be afraid of him any longer. You need not cut him out, because he will come out in the spring of the year a full-fledged beetle, and then he is ready for business. In order to prevent that, if you will take the same kind of wax you used in grafting the tree and put a little on the sunny side, or cultivate the trees well and keep the sap flowing, you need not be afraid of this borer.

MR. CADWELL: The reason of that is the burning of the tree by the sun. It is all in the bark; whenever the bark sours you can find them in the tree.

MR. ADAMS: Let me ask whether a good coat of whitewash would not be effective?

MR. CADWELL: I have never found it so much so as a little shade of some kind, either a shingle or something of that kind, to keep the sun away. They will never lay eggs unless the sap sours.

MR. SLAUGHTER: In Delaware we prune very little, except taking out the dead wood and broken limbs. My friend spoke about the trees growing there in the corners of the fence; they won't grow there. They used to when I was a boy, but now we have to put them up where we can cultivate; still we do very little pruning, except as I have said, taking out the dead wood and cutting back. When we want to put a new top on a tree we would then cut it off. As to the gentleman inquiring about his apricots, my advice would be to take a mattock and dig them out about two feet below the surface of the earth. I think that would be the most profitable way to handle them.

MR. LOCKE: I am a professional non-pruner; I believe a great deal in nature. This discussion seems to be interminable from the diversity of conditions under which each one is placed. I have heard of an Irishman who was taking a horseback ride, and procured a horse and so forth, but he mounted so that his head and the horse's were facing a different direction, and his friend said: "Patrick, you have got on that horse wrong." "Faith," said he, "how do you know which way I am going to go?" Now, I have had experience in the peach business for over thirty years, and I have a little orchard alongside of the road where people pass and they criticise my pruning, and they want to know why I didn't prune sooner or differently, and I thought of this Irishman, "How do you know which way I am going," or what I am doing this for. They know nothing of the conditions under which I am pruning those trees. I have often lost a crop of peaches by frost. Once I lost three crops in succession; I got a little discouraged at that and said: "I will not prune them until I find the frost has left some to prune off." In the meantime I took good care of the trees, kept them well cultivated; I would cut out some of the biggest branches, but I would not give them a systematic pruning, because if they did not bear I would lose all my labor, and I conceived the idea that I would lose less peaches and be more likely to get a crop if I did not prune, leaving all the long branches growing out; also that the leafing out of the tree had a protective influence against the frost; and I think I have some evi-

dence that it would be so; in fact, one year after I had taken off considerable brush from my trees I took some of it and threw it over one tree which had rather a broad spreading top, so that I could do so without any stepladder. I did this to see if I could not protect it from the frost, and that year it was about the only tree I had peaches on; it did protect it. It was the same as leaving the limbs on late and pruning after the peaches were formed; and now that is my practice and I have had excellent results, the best I have had in my thirty-three or thirty-four years' experience in growing peaches in California. I leave my peaches before I prune them at all until they want thinning, until they have passed the frost; then I take my stepladder and one of my men and tell him what I want. We commence then with the pruning shears and cut off those limbs that are full of peaches; you can see how much of a limb to cut. A great many will say you have got to cut a great deal in order to save a good deal of the labor of thinning, but how much shall you cut to do that? If from the frost or any other cause your peach tree bears very sparsely, you cut off two thirds of the last year's growth. If the trees are healthy that is about the rule. If you keep your trees growing healthy you need to cut off two thirds for the sake of thinning the fruit. Suppose you go at it and do that; suppose a frost comes, or from some other cause your peach tree bears a very light crop; don't you see you have cut off a great deal too much. You have got a light crop on your trees, whereas if you left the limbs until you discovered how much fruit you really had on them, you could have so pruned as to have a nice crop of peaches that year; and, by the way, the peach tree, if well taken care of, ought to produce a fine crop every year. I prune the tree according to the proportion of fruit that is on it. If the limb is, say two feet long with only four or five peaches on it, I will see how far they are apart; in general I calculate to prune peaches so that they shall not be within four or five or six inches of each other. One other thing I have learned from experience: after a destructive frost the only peaches we would have would be on the top-most limbs of the tree, indicating that the higher you get from the ground the less frost. Now, I prune to run my trees up; I don't care how high they grow. I have got some at least twenty feet high, and in many years all the peaches I get will be on those tall limbs. In relation to the variety of peaches, every man has got to learn for himself the variety of peaches that thrives where he lives. Here in this county the Late Crawford, which has been recommended to us as a fine peach, does nothing. I think it must be too late.

Recess was then taken till evening at 7:30.

EVENING SESSION.

FLORAL CULTURE, WILD FLOWERS, AND ORNAMENTAL PLANTS.

WILD FLOWERS.

By MISS LILLIAN HOWARD, of Santa Cruz.

The great mass of wild flowers form the unconsidered trifles of our fields and plains. They owe no thanks to man, for he does not care to perpetuate them, neither have they fear of him, for they do not, as a class, infringe upon his domain. A few may please him by their brilliancy of coloring, as they grow in masses, and blend harmoniously with some pleasing landscape; their patches and bands of blue and white, and their long stretches of gold and orange may compel attention and even admiration. A few may please the casual observer by the beauty or peculiarity of their forms, as in the case of the rose, the lily, the dicentre, and the lady slipper.

A few have become general favorites on account of their extreme delicacy of form and color, as the baby blue eyes and the lilybell. But it remains a melancholy fact that the popular expression is a cynical smile and a suppressed murmur of *weeds* when the subject is broached.

Well, there are weeds and weeds. A few of our flowers have become social outcasts, and lift their dainty cups rather saucily, without receiving an admiring glance, except from some misguided botanist, or, maybe, a sentimental but unsophisticated young lady, who is informed, with a covert smile, that she may have a whole county full, and welcome, if she will only pick them out. The bind weed, red sorrel, and the so-called yellow heliotrope may serve to point a moral, and arouse a smile at the expense of an enthusiast.

Weeds? And how different they really are from weeds. The real weed is as much of an aristocrat as wheat or corn, and usually gets the same amount of cultivation. He lives by his wits, but gets the best the land affords. Of course we do not mean the timid one that peeps up along the wayside or in neglected fence corners, or takes unto itself a bit of waste land, to be cast out the first time the soil is turned by the plow. We mean the kind that tries to take the whole farm; wants to grow in the mellowest soil; overshadows the young crop above ground, and sends out millions of little roots to choke it off under ground. The flowers are inconspicuous, that it may not waste its substance in show. Its seeds are produced in countless numbers, and of course they are ripened and scattered before the crop is ready to be gathered. These seeds are furnished with quaint devices for preservation and dissemination, as burs to catch the coats of passing animals, little hooks to anchor themselves to the ground or other weeds, twisted awns to cling to the ground, down that will float them far and wide on the breeze, and lastly a bitter or nauseous taste, or a gummy coat to discourage the browsing propensity of animals. Whatever plan man or beast contrives against them they try to meet it in time with a cunning device for defense.

so, after a long and relentless war, our most troublesome weeds are developed.

Their vitality has furnished a subject for epigram and moral in all ages, and the longer they have contended against man the more exasperating they are. For it is a well-known fact that the strong, aggressive weeds of older settled countries overtop and thin out the weeds of new countries which have not been compelled to fight for their lives. So weeds are as much the result of selection as the giant pansies, rainbow roses, and Japanese chrysanthemums of the horticulturist. Then, our flowers being the result of modifying circumstances and conditions through a long course of years, whatever serves as a distinguishing mark in our cultivated as well as our wild species is the sign to tell the story of their lives to him who reads.

But there are always two sides to a story, and if the thistle and the cactus could tell of their wrongs, no doubt the story would reconcile us to their prickly skins. If, as I said, imitation is the sincerest flattery, what intelligence we must grant some of the wild flowers of our hot, dusty plains and hillsides. There grows the Mexican poppy, with spines and needles that would outstick a Canada thistle, and with the same dusty, white downed leaves as its thistle neighbor. A casual observer would readily mistake it, and it is only when the glory of its delicate white blossoms are unfolded that the cheat is discovered. Who and what was the enemy against which the cunning flower fairy first armed himself? That its defense is secure, the rash investigator can mournfully testify.

There must have been a wonderful omnivorous beast of the field prowling these plains in those old days, or it must have been a much starved one, for this poppy is not the only plant which has here thrice armed itself. A species of wild sage has adopted the same livery, and pushes out its curious long blue corollas with its salmon pink anthers from a bristling circle of prickles that would do honor to any thistle. Blue is the bee color fortunately, and I am sure no other creature would willingly face the outpost for the sake of the treasured honey.

The mentzelia is a co-resident of these advanced thinkers, and is almost converted to their ways; it is not quite so dusty, not so prickly, and much more showy than its neighbors. Protection is their motto, for on those wide stretches of dry country the race is to the one who will not be eaten, and to the one who will not be killed by thirst; so the object of their little lives is to store up their moisture, to hide themselves, and to be unpalatable when found.

Leaving aside these flowers as denizens of the field and of the wood, and viewing them in the sacrilegious light of transplanting, our query is: "Which of these is suitable for cultivation?" This question has been answered for us in a great measure, for in many catalogues of Eastern growers our flowers are well represented. Among them are the California poppy in its yellow and gold, and its developed cardinal cousin, the nemophila, in all shades and sizes; the limnanthes, and the Mexican poppy, which has recently been a favorite, while the *Romneya Coulterii*, with its great crepe-like white blossoms, has won a lasting reputation for itself.

The tiger lily, the azalea, the rhododendron, where it will bear transplanting, the spires, the clematis, and the scarlet gooseberry, under the ambiguous name of coral plant, have already enriched our gardens, and where one can withdraw himself from the worship of varying

forms of our common garden flowers, he will find these most charming companions. They give a wild, saucy air to the garden, but it must be acknowledged that they look as if they felt degraded and longed to escape.

The salmon berry, with its red flowers and luscious-looking fruit, seems to be challenging one to a feast worthy of the gods; maybe the gods could eat them, but at present they are rather sour for the human palate. Culture ought to do something for them.

In our forests grow shrubs and trees that would lend themselves favorably to artistic gardening, as the chinquapin, with its gold-lined leaves, the California nutmeg or yew, and even our common buckeye, with heavy blue-green foliage, would prove invaluable if properly managed. The madrona, the tree-like manzanita, and the laurel have already been tried and have been heartily approved. They belong to our climate, and can be disposed of in landscape gardening with as much grace and relief as the foreign trees.

But our most beautiful wild flowers are found in our fields and in the borders of our forests, as the popularity of our cream-cups, nemophilas, gillias, and lupines show. Our lilybells, too, are a revelation in themselves, and an open hillside with yellow calochortus, Johnny-jumpups, and pink mallows is a feast for all eyes.

But the snowy lilybell is our poem; in color, in form, and in manner of growth it appeals to us, and though usually called by an uneuphonic name (harebell), it is still the one treasure of our fields most valued. It varies in color from a deep, dull crimson to a clear white, tinged with pink and green, and the pretty balls hang in clusters of from three to ten on their slender stems. Then its cousins of all colors, the golden lilybell, or Diogenes' lantern, the many-colored Mariposa lily, the white clustered variety with its long leaves, and the pale-lavender variety are almost as interesting as itself, and furnish many a suggestive page for the paragrapher, the sketcher, and the poet.

In fact the lily family is well represented in our State, and our fields can vie with our gardens in presenting this most graceful flower. The tiger lily, the white Washington lily, and some smaller varieties remind us in a dignified way that Dame Nature is still in the race with man for horticultural honors. The eagerness with which picnic-goers storm the preserves of the tiger lily is a lasting tribute to its beauty and grace. But, alas! the cows are just as fond of it, and only what they cannot reach is left for the human flower-lover. We respect the craft of the thistle now, and wish for armor for the lily.

In our hasty survey, we can pay only a passing tribute to the beautiful members of the pea tribe which flourish among us. In richness of color and in variety they are surpassed by few other flowers, and as it is always a pleasure to see a well-known face in a crowd, so we are glad to come across the familiar butterfly petals in a wilderness of new plants. The lupines—yellow, white, and all shades of blue and purple, with occasionally a pink stranger—the clovers, the vetches, thermopsis, and a host of kindred with most unsocial names, are among the gems which brighten our fertile land.

On the subject of names, let us present a brief plea. One is debarred, of course, from speaking of the scientific names; they are settled, as far as one can judge, well settled; but the local names, the home names, are insufficient, and so loosely applied that it is simply exasperating to

try to verify many of them. There are a number of pretty names afloat which are applied to many flowers, as bluebells, wild pansy, and wild forget-me-nots, and there seems to be no particular flower that can prove its claim to the name. For instance, the name wild heliotrope is given to several widely varying plants, and there is a true heliotrope, rather insignificant in size, but even the least has a right to its name.

In one case I saw, in a widely advertised collection of wild flowers, a flower-cluster nearly three inches long, bright scarlet in color, labeled with the name bur-clover. Of course, one does not wish to be too particular, but the line must be drawn somewhere, and a reasonable amount of accuracy is not to be despised.

Many of our beautiful and effective plants have no common English names, and it is so easy to prefix *wild* to some familiar name, and so hand it down, a delusion and a snare to all botanically inclined students. Most of our native flowers probably have Spanish names, and musical ones, too, given by the people who have lived with them, have seen, with a poetic eye, their many charms, and have had many tender associations connected with them. These names we should preserve, as far as possible, for they are usually pointed, picturesque, and perpetuate the traditions of the soil. Our madrona and manzanita are good examples of this class of names, and they seem to be popular; others, as *chicolote*, *yerba buena*, and *yerba santa*, are fully as pleasant to the ear.

For a long time it was the style to adore wild flowers, but a careful observer could see that all who adored them chose the largest and brightest, or those most easily obtained; the true flower-lover then, as now, guarded his treasures with a somewhat jealous eye.

The popularity our flowers enjoy in other places may be only another proof of the old proverb, "A prophet is not without honor;" but the interest shown in the recent field-flower contest among the pupils of our county proves that we do not need to hear from abroad before learning to value our home treasures.

DISCUSSION ON WILD FLOWERS.

MISS HOWARD: I have been asked to say a few words about the golden rod. As you all know, there has been quite a discussion going on in the papers for some time, and the golden rod was at last chosen for the national flower. I have a small specimen here, a native of California, which does not grow so large and so beautiful as it does in the Eastern States. This is the kind that grows here. I think I heard something recently about a flower to be chosen as an emblem of the State. I do not know whether or not anything has been spoken of here about it, or whether anything has been done. I would like to hear from some of the rest on that subject. I have a little more to say on the subject of the flower selected by each State. I believe in having a national flower; I think we are much greater as a nation than as a State. I have three flowers here [showing the paintings]—the California poppy you are all familiar with; one of the others is the *Romneya Coulteri*, of which I spoke this evening. The white calochortus is very common in this country, and familiar to all of us. I do not know whether or not its

range is as extensive over the State as the poppy. I have not a romneya here; I am sorry I didn't bring one, as I have it home, but this is the nearest to it of any of our flowers; the leaf is the same, and it is what I spoke of this evening as the Mexican poppy. The romneya grows in the southern part of the State, and is much larger than this.

QUESTION: Does the Mariposa lily grow outside of the State of California?

MISS HOWARD: I have been told that it grows in northern Texas, but I think the whole family is distinctly Californian.

THE STATE FLOWER.

MRS. McCANN: I had some friends, pioneers of the early days, who got off the steamship and rushed over the barren hills of San Francisco to find the gold. At last they saw a field yellow in the sunlight, and rushed pellmell to be the first to fill their pockets full and send home to their sweethearts, only to tumble head-foremost into a field of yellow poppies; and from that day to this the very name of California comes upon my mind when I see the yellow poppy and remember how disappointed were those pioneers who brought back only the yellow poppy and no gold. Therefore, to take the sense of the ladies and gentlemen, who also may be permitted to vote on this floor, I make a motion that the *Eschscholtzia Californica* be adopted as the State flower of California.

Adopted.

FORESTRY; REDWOODS.

By F. H. CLARK, of Yountville.

There are one or two points in regard to the culture of our local forests, as well as their preservation, that I wish to touch briefly upon, and to these I would call your attention.

Santa Cruz County contains within its limits about two hundred and eighty thousand acres of territory, of which, including the level area on Ben Lomond and in the Pajaro Valley, about seventy thousand acres are "flat" land, the balance consisting of mountains and narrow valleys, originally covered, for the most part, with forests of oak, madrones, pines, firs, and redwoods, interspersed with laurels, maples, sycamore, alder, cottonwood; in short, with the leading varieties of timber found in the State.

I have said that "originally" the forests covered the mountains and narrow valleys of the county; but this was before the lumber men and the tan-bark collectors commenced—about twenty years ago—their work of deforesting the county. During that period it is estimated that there has been cut at least five hundred million feet of lumber from sixteen thousand acres of land, and that fires, for the most part started to clear away brush, to drive deer and other game from their haunts, and by careless "campers" and herdsmen, have destroyed the forest growth over an equally large area.

There remains then, at this time, an area of probably one hundred and seventy-five thousand acres of what may be called "forest" land in the county. This is a large proportion, but in this area is included all that can in any sense be said to be covered with trees, and much of

it (such as the totally barren ridges and mountain tops, the frequent *potreros*—natural grassy openings in the woods—and the thousands of acres of steep hillside land covered only with scrubby chaparral and dense, prickly chamisal), all this must be deducted from the total amount. Then, again, there is a large area (about forty thousand acres) of choice "timber" land, which, being controlled by lumber companies, may be said to be virtually lost, as far as forests are concerned, to the county. Making these deductions we will have in Santa Cruz County, in less than fifty years, less than one twentieth of its area in "forest," by that term being meant land covered with a natural growth of the least valuable trees and shrubs. As for the really valuable and beautiful trees, such as redwoods, oaks, pines, and firs, there will be none left, save a few scattered clumps then carefully preserved by owners of vineyards, orchards, ranches, and country homes throughout the mountains.

As regards the ultimate fate of one of California's noble trees, the "tan" oak, the *Quercus densifolia* of the botanist, I may repeat here what I have already stated in a communication to one of the leading papers of San Francisco, and that is that there is used on this coast every year some thirty thousand cords of tan-bark—not the wood itself, but only its life-giving environment. To make up this thirty thousand cords of bark about one hundred and eighty thousand trees are annually felled; and these poor victims to man's rapacity include all, from the noble veterans whose trunk-girth is only to be measured by fathoms, to the tender sapling one can span with his hands. The former are felled and stripped up into their branches; the latter are girdled in their lower growth, and thus as effectually killed as though the woodman's ax had been laid at their roots.

According to the estimates made by practical "peelers," those whose business it is to exterminate this beautiful tree, there must be twenty-five square miles of forest land searched and despoiled each year to yield the "tan oak bark" required by the manufacture of leather in this State. Every season the "peeler" has to penetrate farther into the forests to procure the bark he covets. He slashes right and left on the mule track he makes through the forest. He *must*, to realize a profit on his contract, mow down, as relentless as Death, the great and small, the growth of a century, the saplings of but a few years' life. He leaves behind him the stark naked skeletons of great trees intermingled with the dying young. It is a war of extermination, in which the young and old, alike defenseless, fall before the weapon of a crude civilization, the keen, relentless ax of the woodman.

Still this beautiful and valuable tree struggles bravely against this destructive agency. It is found growing in all parts of the county, having a range in altitude from near the seashore in secluded spots, to the shady gorges of the mountains at an elevation of two thousand five hundred feet. The deeply channeled bark of its trunk, the dull, soft green of its foliage, and its large acorns, with queer, fuzzy cups, are in striking contrast with its constant neighbors, the smooth-limbed madrona and the noble redwoods. Isolated specimens indicate, by their habit of forming a wide-spreading shade, their value as an ornamental tree, while their rapidity of growth is an encouragement to those who desire to beautify their mountain homes with earth's finest forest children.

I have said that the "chestnut oak" responds easily and quickly to intelligent efforts made to protect its growth. As an illustration of this

I am permitted to use some facts given to me by a prominent county official who, in former years, was engaged in the reprehensible business of "clearing out" these fine trees, but who now, I am happy to say, condones his former fault in this respect, by strongly advocating the preservation of such as are left, and stands ready to prove the soundness of his conversion to the doctrine of the conservation of our forests by contributing all that he can to that end. This gentleman states that twenty-one years ago he felled the marketable "tan oaks" on one thousand acres of land in this county, *carefully avoiding injuring the young trees*.

Seventeen years after he made a raid on that new, young growth on the same land, and "cleared up" just one half of the original output.

And this oak is readily grown from the acorn, and the acorn can be readily obtained. There are hundreds of narrow, quiet ravines in this county where this beautiful tree would flourish, and all that is needed to secure within a few years picturesque groups is that the owners of such romantic glens shall, when visiting them (as they all do on mild winter days, when the hurry and bustle of gathering the products of vineyards and orchards is but a pleasant memory), take with them a pocketful of the acorns and plant them here and there. Doing so, they can count upon seeing the young trees grow, and can feel that they have fulfilled at least one of the paramount duties of man, which are said to be that he shall "leave children behind him, *plant trees*, and write a book." We all achieve the first; it is possible to all that they fulfill the second requirement; too many, perhaps, inflict upon a suffering public the third.

I wish to enlist your interest in another forest tree common to this county, and that is the Monterey pine (*Pinus insignis*). Having its native habitat upon the coast, restricted north and south within a few degrees of latitude, this pine is distinctively a Californian product. It is a noble tree in respect to its wealth of foliage, its symmetry, and its possible usefulness. It attracts the attention of all who look upon it. It well deserves the panegyric bestowed upon it by a gifted lady of San José: "Oh, those beautiful, mournful, music-haunted pines! They clothe the whole long promontory with loveliness. Wherever they have been undisturbed they spring up in tall, straight groups, and so mingle branch with branch, top with top, as to shut out the sunshine and almost hide the blue, over-reaching sky. But fire and tempest and the destructive ax have thinned out their ranks, until open spaces and broad vistas are the rule and not the exception."

Though this fine tree has its habitat on the coast—flourishing among the sand dunes—its seeds, if sown upon the dry uplands of the county, on steep slopes looking towards the sea, will germinate and grow, rewarding the planter in a few years with their wealth of odorous foliage, making glad the desert places.

Akin to the Monterey pine is the form familiar to those whose homes are in the Santa Cruz Mountains. There flourishes the knob-cone pine (*Pinus tuberculata*), and there this rare variety should be conserved. Quoting from Prof. J. G. Lemmon's report to the State Board of Forestry, it may be said that "the striking peculiarity of this pine is the persistence of all its yearly crop of cones, the oldest gray and weather worn, the youngest shining with yellowish green luster; all, whether old or young, retaining their wonderful vitality." To secure the seeds of these, as well as of the Monterey pine, all that is required is that the

cones shall be gathered before they open (any time during the summer), and to then subject them to a rather high heat (such as given out from the oven of an ordinary stove). There follows then a queer ticking, as of an old fashioned watch, and the seeds are readily shaken from the open cone. These seeds, scattered a little below the surface of the sterile regions surmounting the mountain lines, will grow and beautify a region ordinarily stark and barren.

The *Pinus tuberculata*, or "sun-loving pine," as it is sometimes called, is the variety commonly found on the upper ridges of the Santa Cruz Mountains, and while those who are clearing land for cultivation on these slopes are grubbing out all the natural growth, it may be worth their while to spare the pines. The trees take up little space; they respond kindly to the cultivation of the soil about them; they are elegant in shape, rare in numbers, and should be carefully conserved. Moreover, when fires run through the dense underbrush in which they grow, the flames, flashing upwards to their tops, aid by their heat in opening the otherwise persistent cones, and thousands of young trees clothe the ground around the parent stem. These bear transplanting well, and should be used in decorating the homesteads of the Loma Prieta Range.

There is found in Santa Cruz another tree which, for its rareness, beauty, and usefulness, takes rank with the notable trees of the world. This is the *Torreya Californica*, or California nutmeg, a stately tree as found in Scott's Creek, and still beautiful, though scorched by fire, on the Loma Prieta Range. Under favorable circumstances this tree attains a growth of sixty or seventy feet in height, and its long slender branches are pendulous, simulating the grace of the weeping willow, while retaining its individuality as one of the finest yews known to man. Its abundant seeds, like the small cones of the redwood, grow freely in any moderately moist soil, and as they can be obtained at a trifling cost, they should be sown in our mountain gulches.

Having thus briefly mentioned some of the forest trees indigenous to this coast, and especially abundant in this county, it will be expected that I should say something about our "redwoods" (*Sequoia sempervirens*). Having made these noble trees an especial study during the past year, I approach them always, I may say, with reverence. As giants and patriarchs of the forest they stand alone. Nowhere throughout the world can be found living trees that are more majestic and inspiring. There is a grand symmetry in the growth of these great trees quite distinct from the sturdy habit of the ancient oaks of Europe, the towering grace of Australia's somber eucalypti, the pillared shade of the sacred banyan trees of India, or the dome-like, sepulchral forms of the great African baobabs, all of which have excited the admiration, yes, the worship, of man from remote ages.

Involuntarily one associates the sequoias in antiquity with the pyramids, and while wandering about their massive trunks one half expects to find there the ruins of fanes and temples as ancient as those on the banks of the Nile, or the quaintly sculptured monuments of the Taltec and Aztec races found half buried in the dense forests of Chiapas and Yucatan.

When the great trees we gaze upon were seedlings (such we still find in each early summer springing in thousands from the cool, damp earth from which their parent trees rise in towering beauty)—when those

great trees began their growth the Egyptian pyramids were fresh from their builders' hands, the foundation stones of those of South America were not yet laid.

In those dim distant days the very *land* from which they sprang was, the geologists affirm, yet newly upheaved from the ocean depths. The rugged ranges of the Sierras (on whose western slopes the *Sequoia gigantea* is only found) looked down upon the broad, shallow lake covering the valleys of the San Joaquin and Sacramento; while on the Santa Cruz range of hills the delicate foliage of the *Sequoia sempervirens* (our own redwoods) began to tinge with green the otherwise bare elevations.

It is a pleasure to linger in the redwoods to contemplate their greatness. Each tree has a well-marked individuality, a character, as it were, of its own, as marked, in its way, as the varied forms and features one meets in every assemblage of men of the same race. While all bear, in their more prominent features, the stamp of close family relationship, each illustrates in the highest degree the perpetuation of race characteristics. They combine in their perfect symmetry the ideal of the architect who strives to combine size and height with grace. The Eiffel tower, with its broad-spreading base and its towering height, is but an unconscious copy of the sequoia as we see it in its California home. The trees are grand without being oppressive; noble but not arrogant; lords of the soil that do not impoverish the land.

We seek their companionship with quiet satisfaction; for, in striking contrast with the heavy shade and gloomy depths of our great pine forests, the shadows in the densest growth of redwoods are made soft and semi-luminous by rays of sunlight piercing the feathery foliage, glistening through the pillared glades, illuminating the warm brown and somber gray trunks of the grand trees, and "awakening to more vivid tints of green the swaying branches sweeping the clear blue sky." And this commingling of light and shade gives to daylight in the redwoods a peculiar softness in keeping with the stillness of the scene.

As the bright light of a summer's day is softened and subdued by infiltration through the emerald spray clinging to the downward sweeping branches, so the winds that may be heard rushing with a muffled war through the slender spire high overhead, scarce stir the hazel's pendulous leaves or the feathery fronds of ferns clustered about the great tree roots. Now, on this occasion, as well as when we wander amongst the redwoods, the flight of time stays us in the contemplation of their beauty and grandeur.

Let me, then, conclude this most imperfect sketch with a word regarding the propagation of seedlings of the redwood, and the preservation of some small group of an ancient growth.

Bearing, as the trees do, a wealth of small cones from which the small, flat seeds easily escape, it is a not difficult task to gather the latter with the light debris about the parent tree. Scrape together all you find of loose vegetable matter beneath a bearing redwood late in the fall, and scatter this in damp ravines, on sheltered, moist hillside slopes, and you will be rewarded by a growth of young trees you can thin out at your pleasure.

As regards the preservation of the older trees, that is a more difficult matter. Not that they are going to decay, on the contrary, as noticed by Mr. John Muir, who has made the giant trees of the Sierras his lov-

ing study, "No one ever saw a diseased redwood." They are felled by storms, by earthquakes, and by the ax of the woodman. Here and there they are undermined by floods; but though eaten out by fires, reduced to mere shells, they still send out a vigorous growth of branch, and leaf, and fruit.

Their preservation depends upon a sentiment. As sentiment never yet annihilated a paying industry, we cannot hope to stay, wholly, the ax and saw of the lumberman. But popular opinion, combined with action, if directed intelligently towards the setting apart of some one section of the noble redwood forests (such as exist in the "Big Basin" region in this county), will, I believe, save for our present delight and for that of the generations who come after us, at least one grand forest of the *Sequoia sempervirens* such as the world cannot show elsewhere, such as a thousand years cannot reproduce.

That these efforts will be, are being in fact, made, none can gainsay. That they will be aided and encouraged by all who believe in the humanizing influence of "Nature in her visible form," we all believe; and that these efforts, thus sustained and encouraged, will be crowned with success, goes, I may say, without saying.

Adjourned till the following day at 10 o'clock A. M.

TRANSACTIONS OF THE FOURTH DAY.

SANTA CRUZ, November 21, 1890.

President COOPER in the chair.

REPORT OF COMMITTEE.

Mr. Adams presented the report of the Committee on California Fruits in the Eastern Market, as follows:

MR. PRESIDENT: Your committee to whom was referred the subject of fraudulent sale of Eastern or inferior California dried fruits under the names of our well known and first class products, have had the same under consideration, and beg leave to report as follows: As to the facts in the matter, our only definite information has been the statements of Prof. C. H. Allen, made to the Convention yesterday, of facts which came under his personal observation while at the East in charge of the State exhibit known as "California on Wheels," which statement will form part of the record of this Convention, and need not be fully repeated here. In substance, Professor Allen said:

First—That he saw a sour and almost worthless product, which he believed to be Eastern dried Damson plums, marked and sold as "California Spanish prunes," a name, of course, entirely unknown to this State, and properly representing no fruit of which we have knowledge. In this case the mischief was increased by the fact that boxes in which this fraudulent fruit was found bore the brand of a firm whose connection with the fruit-shipping interests of this State has been such as to warrant Eastern dealers in supposing the fruit sold under their brand to be real California productions, true to name.

In this connection your committee recommend that the Secretary of this Convention send a verbatim report of the remarks of Professor Allen on this particular matter to the firm named by him, with the suggestion that they address to the State Board of Horticulture a letter stating whether they are selling at the East any dried fruit under the name of "California Spanish prunes," and if so, to accompany the letter with a sample of such product.

Second—That he saw dried Egg plums sold as "Silver prunes," and heard them loudly and properly denounced as being sour and unpalatable, instead of a sweet prune as had been represented. The casual conversation about this Convention leads your committee to believe that this form of fraud is in general practice in the trade, to the very great injury of the producers of that excellent fruit—the genuine Silver prune. "Egg plums" is another name under which the very sour plum is sold.

Third—That from what he saw it is his belief that brands of producers are habitually removed and replaced by the brands of brokers, thus rendering it impossible for the careful and conscientious producer here to obtain any credit for his careful and conscientious work.

Your committee respectfully suggests that frauds of this kind are to be expected, to the injury of any business which becomes successful, and that the only possible remedy is the simple one usually adopted in other lines of business—of promptly exposing the swindlers, and warning the people against their practices.

Your committee is using this language advisedly, as more closely than any other expressing their precise meaning. Whoever sells some unknown product as "California Spanish prunes," instead of giving the product its true name; or calls "Egg plums" "Egg prunes," when there is no prune called the "Egg prune;" or knowingly sells Egg plums under the name of "Silver prunes," is a deliberate swindler; and no custom or competition can any more justify such practices than the custom of other criminals can justify them in committing the crimes to which they may be addicted.

Your committee suggests that the proper remedy for this state of things is publicity. It can probably be stopped by maintaining standing yearly advertisements, for a year or two to come, in the leading newspapers of the principal Eastern sections, calling attention to these brands, and warning people against them. Any experienced business man can soon put a stop to the business, if the fruit growers will give him the money to do so. If not prepared to put up the money to pay for exposing the rascals, the matter may as well be dropped. We can no more get rid of these pests without expense than we can exterminate without cost the burrowing gophers, whom they resemble.

Touching the practice of erasing producers' marks and substituting those of brokers, the only remedy is by advertisement, to educate consumers to demand dried fruits in original packages, with producer's name, and to mark the packages by actual branding

or other indelible mark. The organization of the California Dried Fruit Union, which is apparently not likely to prosper as a shipper of fruit, might be utilized by employing it to adopt a trademark, and sell the branded box ends to members only, the association protecting itself by accepting as members only those who were properly vouched for as honest men, and who would, in addition, give written pledges of strictly complying, in their packing, with specified rules.

Rigid integrity and fair dealing are certain, if steadily pursued, to bring their proper reward; so is the opposite, and, as no matter who it is that sells bad fruit under our name, the California producer is certain to get the discredit of it, it is of the utmost importance that we take all steps necessary to protect ourselves. As this work can be properly done only by a permanent body, your committee recommend that the Secretary of this Convention be instructed to transmit to the State Horticultural Society a copy of the remarks of Professor Allen, and of this report, with the request of this Convention that the society investigate the subject, and take such measures in relation thereto as the facts may appear to demand.

Respectfully submitted.

EDWARD F. ADAMS,
D. M. LOCKE,
GEORGE HUSSMANN,
Committee.

Report adopted.

TABLE GRAPES.

By W. H. GALBRAITH, of Santa Cruz.

It is recorded in sacred history that those who went to spy out the land returned laden with grapes, and declared Canaan to be a region abounding in the wealth of nature's products—a land flowing with milk and honey. But we notice that they brought neither milk nor honey as a proof of the wonderful richness of the promised land. They returned with a bunch of grapes so large and heavy that it had to be swung on a pole, and carried between two men, and they were, without doubt, table grapes.

It seems, in all ages of the world, and in all climes where the fruits of the earth are most luxuriant, that the grape has ever been considered the highest type of fruit that nature, with lavish hand, has bestowed upon mankind. In both sacred and profane history no other fruit of the earth is so frequently mentioned as the grape, especially if we include the products thereof; and no other vegetable growth is so often employed by way of figurative illustration as the vine.

The history of the vine is contemporaneous with the history of man; but the grapes of Eschol could not have been more attractive to the children of Israel than are the grapes of California to our less favored brethren of the snowy East.

We sometimes wonder, however, whether the old rule as to the unattained would not have held good in the case of the Israelites, and whether unlimited indulgence in the fruits of the promised land would not have engendered indifference, even to the extravagance of nature. However that may have been, if the market price of table grapes were taken as the criterion by which to judge of the favor in which they are held by the general public, certainly, in this year of grace 1890, we would be compelled to put the grape very low in the scale.

It is difficult to believe that so toothsome, palatable, and healthful a fruit as the table grape of California can fall into disfavor with the public. It is more probable the people have become surfeited with a good thing, and, like the man who had eaten gluttonously at the table, have lost their appetites.

The season for the grape is a long one. From late spring till early

winter—a period of nearly six months—the precocious vines of Vacaville and the more backward vines of Santa Cruz can, together, keep the market supplied with grapes to a greater or less extent.

In Santa Cruz County the harvest of table grapes is but well commenced, and, unless severe weather should set it, will continue till January.

The standard varieties of table grapes are common to all sections of the State, and their names are so familiar that they need not be mentioned here. It might be said, in passing, that certain varieties are more successfully cultivated in the cool, moist climate of the coast region than they are in the hot interior valleys, where they are subject to sunburn—a defect almost unknown in this county.

It is well known that grapes are not standing shipment to distant points as well this year as they have done in years past. Inasmuch as the autumn has been exceptionally fine for ripening grapes, we must look for some other cause for this failure to stand transportation. It is probable that the grape, in common with the apple and prune, has suffered from too much water—a misfortune which will readily elicit sympathy from all true friends of the grape.

The subject assigned me is not a very profound one, nor one upon which there is much to be said. The raising of the table grape is about on a par with the raising of potatoes, as far as skill is concerned, and the intelligence required to produce excellent table grapes is not to be compared with that necessary to the production of excellent wines; consequently, we may expect prices to rule low, especially on this coast.

Occasionally, through some act of Providence, one section may gain a temporary advantage over another section, but on the whole there will be no great profit to the producer of table grapes, even though he sell in the most favored markets. Fair profits are all that table grape growers need expect, and perhaps it is just as well for us to learn to be content with reasonable returns for that which makes no excessive demands either upon purse or brain. The fact is there is nothing in the line of agriculture that can be relied upon to yield large returns to the husbandman that does not require more than ordinary perseverance and intelligence to successfully carry it on. The veriest dolt may stumble upon a deposit of gold nuggets that will make him rich, while the man of genius may labor for years to overcome a refractory ore which, though rich in precious metal, would have been passed as worthless by the unskilled miner.

So the world will go on. Table grapes will be produced in the greatest profusion. Our people will feed upon the very food of the gods as freely and as economically as they feed upon potatoes, and with just as much irreverence. Occasionally the producer will get the people into a corner on grapes, just as he does on potatoes. He will then make some money, and be encouraged to go on in the hope of more opportunities of a similar character. In fact, hope, the mainspring of life, is preëminently the agriculturist's dependence, especially in California. Without the hope of wars in Europe, failures of the Delaware peach crop, frosts, early frosts in Ohio and New York, and other hopes of an equally unselfish character, what ambition would be left in the hearts of husbandmen to plant the seed and prune the vine. This hope—that an all-wise Providence will so shape events as to favor us a little oftener than he does remote

peoples—has a wonderfully buoyant effect, and “makes us rather bear those ills we have than fly to others that we know not of.”

The table grape is ubiquitous and quite prolific. It grows readily in this State from north to south and from east to west. It finds a congenial soil either in the alluvium of the valley or upon the sand-rock ridges of our hills and mountains. Not more than eight miles from this place I have seen an acre of vines planted upon the top of a hill in thin, sandy soil that produced in a single season twenty-two tons of table grapes. In this county, provided the soil is not too heavy, the table grape flourishes, whether the vine be trained with a round head or spread out on wires, though, owing to the heavy growth of foliage, it is generally conceded that the latter method is more desirable, in order to give the vine more sunlight and air.

There is one peculiar disadvantage in raising late table grapes in this county. We sometimes have to hope against hope. I remember one season that we grape growers were having a fine harvest, and the season had advanced well into December without a damaging rain; furthermore, grapes were bringing good prices and we were hoping for a continuance of the same sort of dispensation. But over in the Santa Clara Valley—just the other side of Loma Prieta—the wheat farmers were becoming anxious about their plowing, and so strongly did they hope for rain that their hopes found expression in the form of prayer, and the news came to us through the newspapers that the priests on the other side of the mountains were praying for rain.

By some sort of conventionalism or other it has become an accepted article in the world's creed that it is entirely proper to pray *for* rain, but equally improper to pray *against* it. Now, it naturally occurred to us on this side of the mountains that if the priests' supplications were favorably heard, some droppings might fall on us—a consummation devoutly to be abhorred. Well, after all, this little circumstance but epitomizes the world.

Thus, ladies and gentlemen, I have rather unwillingly treated a subject about which there is less interest than there would be if the table grape had more foes and a more certain market.

OLIVE CULTURE.

By W. A. HAYNE, JR., of Santa Barbara.

Feeling sure that olive culture is to become one of the leading industries of California, I deem it of more importance to give my own practical experience than to write anything about the historical olive tree, or give any flowery picture of what was done thousands of years ago with this famous tree.

My own experience in olive culture might be of benefit to those who are contemplating planting olives; I therefore venture to give some of my ideas. I say my practical experience, because I believe in this lies the only true road to success. Much has been written about olive culture, and mainly in regard to European experience. From what I have read in French, Italian, and Spanish works, while at the same time I have steadily grown the olive for nine years, I do not believe that foreign ideas will do to follow out, nor do they apply to California.

I certainly would not have known this had I not found it out by the practical manipulation of olive cuttings and olive trees, as the thing is worked in this State. One idea which seems to prevail is that the olive tree will grow and thrive on thin, poor land, rocky land, in fact any sort of land; that all the useless spots on a place will grow olives finely; that the Lord made these spots on the earth for the olive. I do not blame a man who has had no experience for at once believing this; it is natural that he should; I at one time thought it must be so. My experience, however, has taught me better. I will admit that the olive tree is hardy, and that it will live with very little care, but those of us who plant olives do not propose to be satisfied with merely seeing the tree live; we want it to grow, and grow big, and hurry up in every respect.

I have planted trees where I could not cultivate them—among the rocks—and at the same time I have planted them where I could do good cultivating, and at the end of two years it would be hard to convince a stranger that the trees thus cared for were really of the same age and planted out in orchard at the very same time. The idea of sterile, thin, rough land being good for the olive is all nonsense. I dare say that many a man has refused to purchase good land for his orchard of olives, because he was led to suppose that \$2 land was as suitable. I do not pretend to say that one must have rich, heavy lowland for olives; this would be almost as bad for the tree as the poor land which I have described. The first described land I would recommend for goats; the second, heavy lowland, for corn and pumpkins. We have plenty of other kinds of land—soil that is better than the goat land, and yet not so expensive as the corn land. My experience has shown me that the olive tree does best in places where the soil is deep, and especially where the land is new; but the ground must be of a light character, easy to keep loose; sand or gravel mixed in is very good, but not necessary; especially must it be naturally well drained and have a good exposure. The water must drain off from the roots, leaving the ground moist, but not soggy. Most of my trees are planted thirty feet apart; some are twenty-five feet. I prefer a greater to a less distance.

To save expense have your land as near level or gently sloping as possible. Leave the ends of the rows far enough from the fence to enable the plowman to easily swing a four or six-horse team; in this way much money will be saved in cultivating. Where land is cut and broken, or rough and stony, one, or at most, two-horse teams must be run, and thus four or five men must be employed where one man would do if the above plan is carried out in laying out an orchard. One live man can cultivate an orchard of five thousand trees for three or four years, with only occasionally having a little help. Of course, after this time there will be considerable pruning, and soon after fruit picking will require more labor. Children, however, if looked after, can gather the berries as well as men, and it costs very much less.

In regard to propagating the olive, I have had much experience. I first commenced to propagate them from cuttings fifteen inches long and of all thicknesses; I planted them in ditches four feet apart, and in the row from ten to twelve inches, covering nearly the whole cutting, hardly exposing any of the top. I cultivated them well, and those that grew when two years old were ready to plant out in orchard form. In using large cuttings, however, many will die, and one cannot count on getting a good percentage of them to come. In fact, this old method does not

pay any longer, when one raises trees as I do for the market, and as I raise many thousands for sale I have abandoned this method.

Besides what I have here mentioned, there is another very important thing. The larger the cuttings are the less roots they develop. Most all of the nurserymen now are propagating from what they call "tips," that is, the extreme ends of the branches; these are easily obtained, which make it an inducement. This method I have carefully experimented with, and have about abandoned it. It is a very slow way, and those that do root when a year old are such little bits of things that it is really discouraging. The roots, however, that they develop are pretty good, only they seem feeble and make slow growth.

The plan that I now have hit on is a much surer way and develops remarkable roots, and grows five times faster than the "tip" method. I use sprouts taken from trees in bearing; they make a very thrifty, fast-growing tree. I now have over eighty thousand started in this way, and I shall for the future propagate after this method. One thing I should advise never being done, and that is to plant a large cutting where it is always expected to remain, for this reason: The olive tends to have a surface root, and if the tree is never transplanted and set deeper the roots will be too near the surface, and when the tree grows a good heavy top, and the happy orchardist thinks that all is well, there will come a heavy rain which will lay the tree as flat as a flounder, and no staking will ever insure the tree against other storms that will follow. Nothing is more discouraging than after four or five years of care to wake up some fine morning and see hundreds of your trees flat on the ground. What I here mention is only what experience has taught me; transplant, therefore, from the nursery and get all roots well down.

I have planted several large orchards in the Santa Ynez Valley, in Santa Barbara County. The one I am now interested in has one hundred and fourteen acres in olives. There are about thirty thousand olive trees growing in the valley, most of which I have raised. The trees are now coming into bearing. This part of the county is attracting much attention, and it is looked upon as a grand place for olives. A company has recently been formed, and two thousand acres of land have been purchased, all of which is to be planted in olives. I doubt very much if there will be or is such a vast olive orchard anywhere in California as this contemplated one. The Santa Ynez olive oil is to become a famous brand, as the company I have mentioned will spare no expense to make it known the world over.

THE MANUFACTURE OF OLIVE OIL, AS PRACTICED IN EUROPE.

By L. PAPARELLI, of Berkeley.

RIPENING AND PICKING OF OLIVES.

The ripening and picking of olives affect very materially the olive oil industry, and, therefore, in gathering them their degree of maturity should be closely noted, for on that depends, in a great measure, the quantity and quality of the oil that will be obtained. The ripening of olives varies greatly according to the nature of the soil and of the

climate; of the exposure of the plantation and of the tree; also, according to the variety cultivated and the kind of manure used.

In warm climates and under the influence of strong sunlight the olive ripens more quickly, and in general gives a heavy tinted oil, rich in special aromatic matters. In cold climates, on the contrary, the ripening is retarded and the oils produced are lighter, clearer, and whiter. In moist or rainy climates the olive ripens very late, and the quantity of oil it gives is less. In poor, clayey soils the maturity is retarded and the yield of oil small. In a fertile, calcareous soil, slightly moist, warm and rich in phosphates, the ripening is generally normal and the yield much more abundant. The olive grower, in seeking to enrich his soil, should choose those manures which will hasten the maturing of his crop and at the same time increase its quantity and quality. Finally, the maturity will be early or late according to the variety cultivated, and according to the northern or southern exposure of the tree, or of its branches; also, according to the form given to the tree in pruning, and to the amount of cultivation given to the soil.

In olive oil making the maturity of the olive should be considered from an industrial standpoint, not from a physiological one; thus the gathering of the olive should be governed by the quantity and quality of oil that it is desired to produce.

The ripening of the olive is marked by four variations in the color of the pellicle: (1) From olive-green to lemon-yellow; (2) from lemon-yellow to red or purplish-red; (3) from purplish-red to wine-red; (4) from wine-red to a velvety black. Generally, under moderately favorable conditions of soil and climate, the velvety-black color will mark the proper time for gathering the olive for industrial uses, though the ripening is physiologically continued for some time longer. However, the exterior coloration of the olive is not an infallible sign of its ripeness, for there are modifications in this coloration, and variations in its intensity, dependent on the different varieties cultivated. It should also be borne in mind that the velvety-black tint in olives grown in a cold climate does not represent the same degree of ripeness that the same tint does in olives grown in a warmer one; so that these and other general considerations, though giving an approximate idea of when to gather the crop, must be supplemented by local experience, which alone can determine the exact time. Whilst noting the color of the outside of the olive, it must also be cut, and the pulp examined to see whether it is whitish or colored, observing also the quantity of water and the particles of oil it contains. Notice should also be taken of the stone, whether it is still white or has become brown; and of the taste of the juice, whether sweet or bitter, and so on.

If, in the extraction of the oil, high quality is the object in view, the olives must be gathered when they show the velvety-black color in cold climates; but, as in warm climates, this color corresponds to a certain overripeness, in order to obtain an oil of equal delicacy the fruit must be gathered whilst still yellowish, and hardly commencing to redden. If, on the contrary, the oil maker cares little about the high quality of his oil, but aims principally at quantity, he can gather his olives at their complete maturity. He ought, however, never to leave them on the trees longer than this, for they will gain nothing in oil, and run the risk of being spoiled by climatic causes, or by birds and insects; and in this case, the oil he will obtain will be of even inferior quality

that intended, and it will keep poorly. Summarily, then, it may be said that olives gathered a little *before* their perfect maturity yield an oil of superior delicacy and fruity taste. Those gathered a month later give an oil of ordinary quality, whilst those gathered very late give a very inferior oil, which can only be used in the manufacture of soap, or for illuminating and lubricating purposes, etc.

The oils furnished by fruit of different degrees of maturity may be characterized thus: Very ripe olives furnish a bitter oil; those which are nearly ripe give an oil which has a fruity taste, and, everything considered, is better than any of the others. Olives which are completely ripe produce an oil with a strong flavor which is hardly agreeable, and is subject to becoming rancid; overripe olives yield a very greasy, thick oil, which it is very difficult to keep from spoiling.

METHODS OF GATHERING THE OLIVES.

The ripening of the olives not being uniform on all trees, and varying even on the same tree, two or three separate pickings are generally made. This should be done in good weather, when the atmosphere is clear and dry, and when the soil is not damp from previous rains. Four ways of gathering the olives are practiced: (1) Picking up those which have fallen on the ground; (2) picking by hand; (3) beating the trees; (4) shaking the branches. The falling of the olives may be caused by climatic influences, or by animals, or finally by overripeness. These fallen olives are gathered and kept separate, to be used for the making of an oil of inferior quality.

Hand-picking is the method most to be recommended, as it does not injure the fruit in any way; and in a country like California, where the olive trees have not yet arrived at any great height, it should be practiced exclusively. Hand baskets are the best receptacles to use in this way of gathering.

Beating the tree with a pole or stick is the worst possible way of harvesting, and should only be practiced in exceptional cases, as it damages both the fruit and the crop, doing harm also to future crops.

Shaking the branches to make the olives fall, though less pernicious than beating the tree, is not to be recommended except in certain cases; that is, when from the height of the tree or the extent of the branches the olives grow out of reach of the workman's hand. As shaking the tree only detaches the spoilt or overripe fruit, it cannot be considered as a rational mode of harvesting. The conclusion then is, that it is absolutely necessary to pick by hand if we wish to avoid all danger of injuring the quality of the oil, or of lessening the future production of the tree. Beating and shaking should be limited to those exceptional cases where the olives cannot be reached by any available means by the hand of the workman. It must not be forgotten to spread cloth sheets under the tree to save the olives from being still more damaged by falling directly on the bare soil.

SELECTION AND PRESERVATION OF OLIVES.

The olives should be selected to a certain extent during the gathering, and more completely and carefully afterwards at the oil mill. This selection is of great importance, as the fruit communicates to the oil all the qualities and all the defects that it possesses when worked.

To transport the olives from the orchard to the oil mill sacks should never be used, but some receptacle with unyielding sides, in order to protect the fruit from being damaged on the way. For this purpose baskets of different sizes and shapes are the most suitable, but in case they cannot be procured, whatever is used must dry easily and not be too porous or absorbent, like soft wood.

The handling of the olives in filling and emptying the baskets should be done very carefully, in order not to break the skin, for in that case, the pulp being exposed to atmospheric agencies, fermentation is likely to set in, and extend to the rest, rendering it impossible to preserve them till the time desired. Oil made from such fruit will not only be inferior from the beginning, but will very quickly acquire a very disagreeable, rancid taste.

The object in selecting is to separate the fruit into four different qualities: (1) The good olives; (2) the dry, or frostbitten ones; (3) those which have been broken, crushed, or in any way damaged in gathering; (4) the spoilt olives. It is unnecessary to say that in sorting over, all leaves, twigs, etc., must be picked out.

It may be objected that to put all these details into practice would entail too great an expenditure of time and money; but when we consider the much greater price for which superfine oils can be sold, and the loss there will be in making only one grade of oil from the olives of different qualities, the practice of sorting will be found to be an economy.

Sorting by hand alone can only be practiced on a small scale, but by the use of an appropriate apparatus, moved by some motive power, large quantities can very quickly be sorted. This apparatus does not make a very complete selection, but is a great saving, even if the separation has to be finished by hand.

CONSERVATION OF OLIVES.

In a rational treatment of olives they ought to be kept as short a time as possible after picking, for to keep them for any length of time, in order to work them at one's convenience, is as little practicable as would be the keeping of a similar quantity of grapes to be crushed later. The principal end to be kept in view in the keeping of olives is the prevention of all heating of the mass that would cause fermentation. But as the time which elapses between the picking and the working should be as short as possible, the capacity of the oil mill should be proportionate to the size of the olive plantation; in this way the delays and losses which are so common in many oil factories will be avoided. Of course it is useless to attempt to preserve any but the olives picked by hand, and in the best condition; all others must be crushed immediately, as they cannot be preserved by any practical means.

The only good method of preservation is to make use of trays or shelves of willow or cane; all other methods offer insuperable objections. These trays are arranged on shelves in a cool and well-ventilated room, facing north. The thickness of the layer of olives on each tray ought to average two inches and a half, and under no circumstances should it exceed four inches. Frequent observations of temperature should be made on each layer, and if the temperature rises above 59 degrees Fahr

enheit they had better be taken to the mill at once. In order to prevent any elevation of temperature it is necessary to turn over the olives often, and so cool them by aeration.

With regard to the quality of the oil, the keeping of the olives should be as brief as possible; it is always better to work them immediately, but as that is not generally possible, three or four days should be the limit; in this time the olives lose a portion of their water of vegetation, which, in a rainy season, is doubtless of some advantage.

Even when all the conditions for the preservation of the olives are favorable, they must not be kept too long, as the oil may lose but will never gain in quality. In conclusion, I may say that the oils of Nice and Lucca owe their reputation to the fact that there the olives are worked immediately after gathering, or are only kept a very short time, and with all the care demanded by a rational method of treatment.

SMALL FRUITS.

By Mrs. L. U. McCANN, of Santa Cruz.

At the head of the list of small fruits, in my mind stands the Cuthbert raspberry. I remember ten years ago when we were dependent upon the old Antwerp raspberry for all our fruitage in that line in California; a beautiful raspberry, it is true, if you can pluck it from the vine and carry it at once to your table, but as a shipping fruit truly worthless, as in half a day the ripe fruit taken from the vine becomes so soft that any attempt to get it to San Francisco brings it there in a state of jam, instead of raspberries. Now, perhaps eight years ago, I read in an Eastern catalogue—that source of comfort or torture, as your purse may determine; that source from which we get our inspirations; those beautiful, elaborate Eastern catalogues, that paint such pictures of fruit that you never get—those books have caused me, many a time, to take the money given me for a Sunday bonnet and send my last cent on East for a new fruit; the lack of the bonnet didn't disturb me at all, but it would have been a torture I could not have borne had I not been able to get at least one or two of those high-priced berries, to see what California could do with so fair a stock. In this way, I know not by what little deprivations—a ribbon less, a pair of mended gloves instead of new ones—something of that kind, because in my family I am the only horticulturist—I sent East and paid \$6 a hundred for some of the far-famed Cuthbert raspberries, receiving some little specimens, and cultivated them with that mother love that women give to both children and plants, for I think it is a part of the same mental operation through which mothers take care of each; and by and by from those insignificant little rootlets came strong, vigorous, green branches, and I had them attended to myself with a hoe, bestowing the culture that they required, giving them every advantage that I could as to position and irrigation; and presently they came; for be sure, my brothers and sisters, that "whatsoever a man soweth, that shall he also reap." No fence-corner raspberry could have given me the results that I received from the labor which I bestowed upon my plants; and when in the winter time the old red Antwerps had shed their leaves and closed down business for the winter, in walking through my garden the beautiful Cuthbert grew green

and fair with the first rain, and commenced to send out tender blossoms, and the bees from all the country flocked in to find more sweetness there than anywhere around. I said to my husband, "See what a wonder! for once the catalogues have not misstated things; these are my Cuthberts; I do believe I will have a winter crop." "Nonsense," he said, "the first frost will nip your hopes and your berries too." But it did not. The frost came, and the Cuthberts laughed and went on bearing, and went on blooming and sprouting out, and presently we had all the berries we could eat, and for Thanksgiving a great bowl full, and we sent them to our neighbors, and for Christmas, too. On December 30th we were rather tired of raspberries, we had so many, and I wrote to that grand old paper, which has done so much to build up the horticultural interests of California—I sent to the "Rural Press" a little article; I also accompanied it with a box full of plants, the young branches laden with ripe fruit, and I said: "My dear sir, I do not ask you to take my statement—it is an incredible one, it seems to me—without proof, and I send you herewith a box of ripe berries, boughs full of fruit, branches just coming into blossom, and ask you if any other country than California can show the like on this thirtieth day of December."

Next to the Cuthbert raspberry in importance among raspberries, comes a very much neglected, but, to me, an exceedingly interesting character of plants, called the Black Cap raspberry. In vain I have tried to create an interest for them in the daily shipment of berries that go from my place. The Black Cap raspberry is almost unknown in California; those who have eaten them think they are far superior to the red variety; in fact, many a one who can't assimilate the others finds a delicious and appropriate fruit in the Black Cap varieties, and yet a little knowledge of horticultural principles is absolutely necessary to their successful culture. In the first place, like all raspberries, it is a biennial; that is, it is a plant which grows one year and bears fruit the next year, and dies; the fruit spur dies at the end of the second season; now, if you don't know that, with your red raspberry the cultivation, then, simply is the growth of the young sucker coming up. Now, in the ordinary raspberry, it will not bear until the coming season; with the Cuthbert, from its unparalleled strength and vigor, it sends shoots so strong and early that they are enabled by early fall to commence bearing a crop, which they simply throw in, over and above the main crop upon the same stem which will be borne the next summer season. The ordinary raspberry does not have a winter crop; the Cuthbert does, and the red berries are all over my plantation; it is coming into blossom, and will form new tops everywhere, and, if the season is favorable, will probably give raspberries for shipment every single day, or every other day, from now until March, when we reluctantly cut off the blooming tops, to trim back a little for the coming summer's crop. With the Black Cap raspberry the method of propagation is different. The red berry increases from suckers; the Black Cap berry is a tip-rooter, forming its new root from the end of the pendant tops, which droop heavily as they grow, until they reach the moistened soil, where they send out roots. If one wishes to propagate them and assist nature, as the drooping pendants touch the ground throw a little earth over them, and you have stronger roots for the next season, which you sever ordinarily at the bend, and your next year's plant is from this tip-root. Now, the ordinary plan of the ignorant grower is to say that these Black Cap

raspberries are very mean and straggling kind of things, and they go and cut them off, and destroy every chance of renewing their fruit; then they rush to the nurseryman, claiming that they were not very healthy: "They will die out, and I wish you would replace them." Knowledge is a very good thing sometimes, and especially in fruit growing.

As I make a claim to interest in small fruits of all kinds, and prove my interest by trying every single new variety that is recommended by reliable growers in the East, I should like to call your attention to the Early Harvest blackberry; its blossoms come with a tint of rose upon them, and look like blooming apple bushes. As a gentleman said, walking through my garden in the spring time, "If I had such pretty bushes as those I would put them on my front porch instead of roses." And then the handsome fruit, not so very large but so bright, so shiny, such a good shipper, as the originator says: "It eats so well, it bears so well, it sells so well, and it comes so early, that there should be no garden without it." Since it has already ripe berries in my garden before the Lawton and the Kittatinny have a bloom, of course we have the cream of the market with our Early Harvest before the others come in.

Now, in the way of novelties, there is the Golden Queen, lately originated by the originator of the Cuthbert. I have a very poor specimen, for my vines are very young, but still the golden color gives it a claim to be a novelty, especially as it has the Cuthbert habit of winter bearing. I do not believe for myself, however successful it may be as a plant, and the flavor is very delicate, that it will ever contend with the red raspberry, which is the favorite in the market; and that seems to be the difficulty with the Black Caps, of which the Sowhegan is the one that ripens best late. In vain I have sent them to San Francisco by the chestful, and a few men who have eaten that kind of berry in "mother's garden" way back East, came down to my commission man for them; but he says: "Don't send them in any big quantities, for there is no market for them." Once I sent a chest to him with the simple order: "Create a market, give this chest away; put it where you think it will do the most good."

From raspberries we come, of course, to strawberries. The variety here is the Parry, the most wonderful berry for prolific bearing, for size, coloring, flavor, and the immense power of endurance under all kinds of evil conditions, suiting all soils, being strong, vigorous, and immensely prolific.

There is another part of this fruit business that to me seems particularly interesting, and particularly of interest as a woman. It is sometimes pitiful, as I look back and wipe away a tear almost, as I think of the struggle for independence—yes, I put it that way, struggle for independence in learning how to make my berries a success. I knew nothing of packing, of shipping, and yet by and by, as we grew tired of berries—we had so many—I looked at the prices current of city papers and saw no quotations for raspberries; I thought, it is the day before New Year, I guess I will send some to the city. But my family laughed at it; how absurd, who will want them? "Well," I said, "we will see." I had tried once before to send some to the city; I knew nothing of the proper cases, and it is pitiful to think that I went over to a hardware store and found an empty box as the only thing fitted to carry a raspberry to the city, and I had not wit enough to mark, "This side up with care." Fortunately I have a friend in my commission merchant, who

kindly presented me with a proper case, and sent me some boxes, and said: "Try it again." And I did; this time, with a woman's love for the beautiful, I made my berries look so fair, contrasting, as nature does, the red and the green, and sent them to the city. I sent sixteen little boxes in my first case, and marked them this time with the stencils presented to me by my commission man: "This side up with care." When the result came back there was a little very business-like note to L. U. McCann, Esq. I held the letter in my hand and said: "How much do you reckon he gave me for my berries?" "Oh," they said, "seeing it is Christmas week, maybe it was two bits a box;" and some said "Maybe, as it is so near New Year, he will give you 50 cents; but no," they said, "thirty-five."

I opened the letter and out came a check for \$24 for my box of berries, and at last I was content. Before I had said to my boys: "Oh, help me weed this patch," but they had said: "Mother, hire a man;" and at last I had the ability to hire a man, and I did it, and my \$24 went to hire that man. Then I began business, and since then I have hired a half dozen, and as many as fifty, that is, boys and pickers of various kinds; for next to cultivation comes the question, How do you get your berries to market? I have the honor, gentlemen and ladies, to have been the originator of, I think, the best, simplest, and most comprehensive work of charity of any that I know of, the Women's Aid Work of Santa Cruz. I have always had a heart that went out in its sympathy for women and little children, and meant to combine in my small fruit growing some help for young boys and girls whose parents were poor, and yet who needed some sort of help in vacation, something to do that would not over-strain their young muscles and crook their tender backs, and so I have employed children in my garden as pickers in summer when the big crop was on—the vacations are just about the right time—and I have got as many as I liked; but the American boy is peculiar, and sometimes there are drawbacks in even this line of philanthropic work. At one time I had a large order from the city for a big wedding, and I had promised to fill it, and tried like a man to keep my promise. That day I had hired an extra set of pickers, but unfortunately I didn't know that I had the baseball nine of the Santa Cruz boys for pickers, and when a challenge came from the vandals outside the fence every last boy jumped that fence and played baseball, and the orders had to wait on that game.

It has been a study, too, the subject of picking berries; it is not everybody that can do it. I have had the misfortune to have had for three days a boy in my patch who was color blind, and the consequences of his picking need not be related, but his boxes were a sight to see. I wrote at last to my commission man: "I am fully aware that the bottom of this ladder is crowded, but I want no part or place in it; I am aiming at the top, and I want you to insure those who buy berries marked with the brand 'L. U. McCann' that, though I shall put the biggest ones on top to help you out, they will find good berries clear to the bottom. If they don't believe it turn them out; if there is a bad one in it don't charge them for it, and if you will give me any hint as to how better to present my berries to your market I shall be thankful for it." He wrote me a letter which I prize: "I have been in the commission business in San Francisco for twenty-five years, and there has never been sent, to my knowledge, to this city fruit so finely packed and so beauti-

fully gotten up." I simply tell this to encourage other women here who have aspirations such as I have had. I had forgotten to mention this: I claim in this fruit that I am showing you here a solution of some of the difficulties under which horticulturists labor in dry places where irrigation cannot be carried on; I claim in the Tap-root strawberry a solution of some of their troubles, as the ordinary strawberry has a root simply about three or four inches long, and specimens of this have a root that I have measured going down over eighteen inches, which will enable it to hold over in the dry season and still grow a grand crop in the wet-test season or spring time.

The plant is new; it is not for sale; the fruit I am not yet quite satisfied with, and I am hybridizing it with the best varieties, and I expect in the future to be able to tell you more about it. This strawberry I should have called the "Californian," if another strawberry had not had that name, or the "Eureka," if that name were not already taken; and yet the plain, practical name, the "Tap-root," which tells what is the matter with it, seems to be the best.

VOTE OF THANKS.

MR. LELONG: Mr. President, I move that a special vote of thanks be tendered to Mrs. McCann for her able address.

Adopted unanimously by a rising vote.

A recess was then taken till 2 o'clock P. M.

AFTERNOON SESSION.

Vice-President AIKEN in the chair.

CITRUS CULTURE IN NORTHERN CALIFORNIA.

By S. S. BOYNTON, of Oroville.

The culture of citrus fruits in Northern California is no longer theoretical nor experimental; no longer a conceit, a supposition, nor a belief; but is a solid, enduring, self-evident, and living fact. The orange and lemon are there not dooryard ornaments, set as curiosities, placed in sheltered and protected spots, and are not grown under conditions more favorable than are elsewhere awarded in this State to these fruits.

The Northern Citrus Belt has long been the butt of ridicule, the subject of jest and laughter by those who had interests to subserve in crying down its merits and deriding its possibilities. The time is, however, near at hand when its true light will burst forth with a vividness and brilliancy little dreamed of by those who have not studied its grand capabilities and its enormous territorial extent. Within the next few years such a quantity of citrus fruits will be produced and shipped from that region as will forever set at rest all aspersions or reflections upon that land as a citrus fruit region. The day is by no means distant when its orange and lemon trees will be numbered by millions, and when its annual output of these fruits will amount to thousands of carloads. We are not talking at random upon this subject, nor are we carried

away by enthusiasm. We have given the subject not only months but years of patient study and know whereof we speak. For a full score and ten years the historic orange tree at Bidwell Bar, in Butte County, two hundred miles north of where we now are, has blossomed and borne fruit without the loss of a single crop, and stands to-day a mute but eloquent, green and living witness whose testimony is worthy of consideration and belief. While in a hundred spots throughout the counties of Butte, Yuba, Placer, and others that might be named, oranges, lemons, and olives have been in bearing for the past twenty years, yet citrus culture, in its broad and commercial sense, is still in its swaddling clothes.

In September, 1885, in the town of Oroville, the first suggestion was made of holding a citrus fair in Northern California. Then the Sacramento "Bee" caught up the idea, and asserted that the citizens of Oroville knew that oranges could be grown there, but what was needed was to convince others of this fact. It urged that a citrus fair held in Sacramento, the capital of the State, ought to and would accomplish this purpose. The residents of Oroville coincided with the statements of the Sacramento journals, and those of other towns fell into line. The business men of the Capital City made that exhibition a reality, and fruit from twelve different counties was displayed at the first citrus fair of Northern California. That extensive, marvelous, and splendid display of the semi-tropical productions of the northern part of this State at once, and for the first time, awakened the people of that region to the possibilities of their soil and climate, and was the direct cause of the great planting of citrus trees that has since taken place. The first fair was held in January of 1886, so that the oldest trees put out since that date, and which comprise fully nine tenths of the total number of the whole region, are only four years old at the present time.

It will thus be seen that citrus planting on an extended scale is a new industry in Northern California. The first man to be aroused and stimulated to action was Hon. John C. Gray, of Oroville, who left the pavilion in which that fair was being held, hurried to his home, had twenty acres of land prepared, went to Santa Clara County and purchased two thousand young olive trees, and while the memory of the fair was still fresh in the minds of all, he had these two thousand young trees planted in Butte County soil. He has since continued in the line thus begun, and has now ten thousand young and thrifty olive trees, and from several hundred of these he will this year gather fruit. That he made no financial mistake is evident from the fact that he has since been offered \$500 an acre for his olive plantation.

Other citizens of Oroville were quickened to activity by this example, and an organization of the leading business men of that town was speedily effected. Thirty acres of good land were secured, two of the company went to Riverside and purchased two thousand one hundred Washington Navel trees, and during May and June these were planted on the north bank of the Feather River, in what is now the colony of Thermalito. The land cost them \$100 an acre, the trees were \$1 25 each, and to this must be added the expense of transportation and planting and caring for them during the intervening years. It will thus be seen that these gentlemen were not afraid to back their ideas and opinions of citrus culture with their coin. This grove has since been increased, and at present numbers

three thousand three hundred orange trees. They are now loaded with fast ripening fruit, and will this year yield a large and abundant crop.

Citrus fruit planting was by no means confined to Butte, but all the other counties of the Sacramento Valley felt the influence. A second citrus fair was held in the Capital City during December of 1886, two fairs thus being held in the same year, one in January and the other in the following December; and at that fair the fruit from twenty-two counties was shown.

These fairs and the liberal advertising by newspapers caused much attention to be paid to citrus fruit culture in Northern California, especially in the Sacramento Valley and its adjacent foothills, and it is that section only that I am attempting to present in this article. Trees were planted not only in the sheltered foothills and on high and well-drained land, but in the open valley and even along the low river bottoms—the very last place where an orange grove should be set. As a result of this movement, continued during the past three years, we have in the vicinity of Oroville, Thermalito, and Palermo, in eastern Butte, 98,349 orange, 6,812 lemon, and 49,600 olive trees, a total of 154,761 trees, or in round numbers about one thousand five hundred acres. The number of citrus trees planted in other Northern California counties I am unable to state with exactness, but know that Placer, Sacramento, Colusa, and Tehama have set out a large number, and that Yuba, in addition to her smaller tracts, has planted one splendid orchard of one hundred and thirty acres, or thirteen thousand orange trees in a single body. I believe it would not be unjust to the other counties in that section to estimate that Butte has planted as many citrus trees as all the other counties combined, which would then make three hundred and nine thousand trees, or three thousand acres devoted to the culture of citrus fruits in that part of the State.

It is unnecessary that I should go into particulars regarding the planting of orange trees, the manner of growing the young trees, budding and grafting, and other practical details of that kind. To one point, however, I will call particular attention. Hitherto all the young orange, olive, and lemon trees planted in that section have been brought from Southern California or from Florida. Now there are vast numbers of young trees being raised, and the future planting will be done with home-grown trees. In the vicinity of Oroville there is at least a half million young trees, from one to four years old, and there are large numbers of young trees at Palermo, Marysville, Chico, Auburn, and other places, that will, ere long, be set out in orchards, and thus will be largely extended citrus culture in that part of California.

The market for oranges is considered almost unlimited; on the north lie the great States of Oregon and Washington, with a population of six hundred thousand, while to the east lies a vast territory, a portion of which we may with confidence expect to supply with its citrus fruits. With these certain and ever increasing markets in view, the prospects for growing oranges and other citrus fruits in Northern California is an alluring one. The profits of those who have bearing trees are such as to encourage others who have planted out young orchards and now await their coming into bearing. So flattering are these prospects that during the present year a ten-acre tract of two-year old Navel orange trees at Thermalito sold for \$650 an acre. Sales at Palermo have also been extremely flattering.

If the citrus fruit outlook is now so attractive and brilliant, some may ask why this industry was not pushed ahead long ago, for orange trees have been bearing fruit in that part of the State for fully thirty years. May we ask in return, are there no other latent and undeveloped resources left to-day in that and other parts of our grand State? The olive flourished for four score years in Southern California ere the manufacture of oil by Mr. Cooper attracted general attention to that tree. Fig growing as a commercial enterprise is a comparatively new industry, yet it has been known for forty years that the fig flourished in all the warmer sections of California. Fifteen years ago California raisins were a rarity, while now our output is enormous, and rapidly increasing, yet the vine was known to flourish here in great perfection many years ere raisin making became a business. Cork is worthy of attention here. It is adapted to our soil and climate, and in Spain and Northern Africa immense fortunes have been made in cork—not corks—yet it is a neglected industry in our State. It is certain that money can be made in producing camphor, and that tree grows readily in all our warmer valleys, yet who thinks of planting camphor trees from which to make money? Why is it that we still import rhubarb from Southern Europe when it can so readily be produced here? There is money in licorice, yet that is among the neglected California industries. Our prune production has grown into a marvelous and gigantic enterprise, yet prune trees bore in this State long ere the fruit in any quantity was put upon the market.

Various reasons prevented the earlier planting of citrus fruits in Northern California upon a large scale, and one of these has been by too many overlooked. The orange and lemon have been most successful along the low foothills, as in Yuba, Placer, and Butte. The earth there is mostly a reddish clay soil, mixed with gravel, and which requires considerable water to make productive. Nearly all the water for irrigation in those localities was originally brought from the mountains for mining purposes, and was held at a high price. Now, until the general decline of mining, no man could afford to buy water for irrigating purposes, and from this cause more than any other may be traced the lack of planting citrus fruit trees. When mining declined, the price of water was lowered; men saw that they could afford to experiment, and they began to try various fruits, and to increase the number of their citrus trees. Another reason is the great expense in caring for an orange grove and bringing it to maturity. If the orange is king of fruits, it requires a royal revenue to pay the expenses during the time it is growing and coming into bearing. If to this we add the lack of knowledge regarding the cultivation of citrus fruits among the residents, and the further fact that many believe they could only be grown in sheltered and particular spots where the conditions were unusually favorable, the reason is fairly explained why citrus fruit culture was not sooner begun on an extensive scale.

The first citrus fair at Sacramento was the great awakening. When the fruits of twelve grand counties had been gathered and the productions carefully compared, it was seen that citrus culture extended over a far broader area than people had hitherto realized. The moment this fact was fully impressed upon their minds an almost instantaneous change was effected. It was like the traveler who emerges from the dark forest into the open sunlight of the broad valley, or like the view

presented from the top of a noble mountain when the earth at once grows to the mind tenfold larger than ever before. Vast and almost unlimited possibilities spread out before the residents of that region, and some of these bright visions they set about converting into living realities. Fully three hundred thousand orange, lemon, and olive trees now growing as green and thrifty as they do upon Sicily's bright isle, attest the belief and faith of the people of Northern California in citrus culture in the Northern Citrus Belt. In the single colony of Thermalito there are sixty-one different orchards, many of which are of citrus fruits. In the colony of Palermo there are sixty-five orchards containing 40,348 orange, 5,124 lemon, and 23,646 olive trees. Arrangements are already made to plant during the winter in eastern Butte fully five hundred additional acres to citrus fruits.

The essays, papers, and discussions before this honorable body have always been of the most practical character. Facts relating to the growth of fruit trees, to the best varieties of fruit, to the methods of pruning, the various styles of curing and packing fruit, the destruction of insect pests, and a hundred other useful points are yearly discussed. In presenting some facts upon citrus culture in Northern California I cannot go into these details, because this industry is yet immature and undeveloped.

The citrus trees are almost free from scale, there being none except in one or two localities. The varieties planted are mostly those that experience in the southern part of the State has shown are most likely to be successful. The young trees in nearly all localities are grown without any kind of protection. But little attention has so far been paid to pruning, and no washes or sprays have been used, except in one or two spots where scale has appeared. None so far in Butte County, which is the leading section. In the matter of grading, packing, and boxing citrus fruits no new or novel ideas have been developed. I have only been able to present general facts to you without those practical and useful details that have made the meetings of this honorable body of such great value to all the fruit growers of California. That a grand future opens before the northern part of this State as a citrus fruit region I am fully convinced, and ask your indulgence a moment longer in presenting some figures that may be of interest.

You are all aware that to grow citrus fruit successfully three climatic conditions must be fulfilled: The annual temperature must not be too low, the average temperature of winter must not be below 40 degrees, and the climate at no time during the winter so cold as to kill the trees. This lowest point may be placed at from 14 to 16 degrees, but for the best results it should not be lower than 18 or 20 degrees.

In order to present the claims of Northern California in a fair and candid manner, we have selected ten places in the citrus regions of Italy, and given the average annual temperature, the average winter temperature, and the lowest point the thermometer reached during the year. For convenience we have arranged these in tables:

LOCALITY.	Average Winter.	Average Annual.	Coldest.
Palermo.....	53°	63°	28°
Naples.....	48	61	23
Rome.....	48	60	19
Florence.....	44	58	12
Pisa.....	46	60	19
San Remo.....	48	60	25
Genoa.....	44	60	10
Mentone.....	49	61	23
Nice.....	48	59	26
Cannes.....	49	60	20

The average of these ten places for the winter is 47.7 degrees; for the year 60.2 degrees, and range of the lowest temperature is from 10 to 32 degrees. Taking the same data from ten localities in Southern California, the average for the winter, for the year, and of the lowest temperature, are as follows:

LOCALITY.	Average Winter.	Average Annual.	Coldest.
Colton.....	52°	64°	20°
Daggett.....	47	65	20
Santa Barbara.....	54	61	30
Los Angeles.....	53	60	23
San Diego.....	54	60	32
Newhall.....	48	60	18
Riverside.....	51	60	25
Poway.....	50	59	21
San Bernardino.....	49	60	28
Spadra.....	54	64	28

These figures give the average winter temperature at 50 degrees, the average for the year at 60.5 degrees, and the lowest temperature of the winter at from 18 to 32 degrees.

Now, taking the same statistics for Northern California, and taking localities that fairly represent the whole Sacramento Valley without any selection for favored sections, we have:

LOCALITY.	Average Winter.	Average Annual.	Coldest.
Auburn.....	46°	59°	18°
Chico.....	47	64	20
Oroville.....	52	65	29
Orland.....	52	67	26
Williams.....	48	63	22
Knight's Landing.....	48	63	20
Sacramento.....	48	62	19
Redding.....	48	64	24
Red Bluff.....	47	62	22
Marysville.....	50	64	24

A recapitulation shows that the winter average for Europe is 47.7 degrees, for Southern California is 50 degrees, and for Northern California is 48.6 degrees; that the annual average for Europe is 60.2 degrees, for Southern California is 60.5, and for Northern California is 63.3 degrees. The lowest temperatures of the winter may be seen from the tables.

These figures are taken from the Signal Service records of the Government, and from other standard publications, and therefore should be

accepted as reliable and accurate; and upon the evidence of these figures we can see no reason why even the most prejudiced should hesitate in believing that Northern California will become famous as a citrus fruit region. We firmly, honestly, and sincerely believe that in years to come its low hills and extended valleys will become as noted for their fruits as its mountains have for their gold and its wide plains for their grain. It is true that the Almighty Creator in His infinite wisdom has wisely withheld from man the ability to foresee the future with certainty and precision. The Elijahs and Jeremiahs of old are no longer with us. That Supreme Being has, however, given us in thought, fancy, and supposition the power to rend aside the mystic veil that hides the morrow from to-day, and permitted us to picture to ourselves, in the roseate hues of hope, belief, and anticipation, what the coming years will bring to pass. And as we gaze with prophetic eye into the unnumbered cycles of time, when that land we have attempted to describe shall be enriched by the labors of ourselves and our children, we behold that vast region teeming with millions of happy, prosperous, and progressive people; a country made thrifty and productive by their enterprise and their energy; a land bright with fruits and gay with flowers; its foothill slopes covered with extensive, luxuriant, and profitable olive orchards, rivaling in extent and richness those of Italy and Greece; its broad and beautiful valleys dotted here and there with splendid groves of that noble tree, "laden with fairest fruit blossoms and fruit at once of golden hue;" its warm and sheltered nooks adorned with the continual blooming and ever-bearing lemon; far-spreading vineyards laden with grapes so large, sweet, and delicious that none but California soil could have produced them; magnificent fig trees lift their gigantic tops filled with rich and luscious fruit; lofty and towering date palms, of which the poet says:

"To man the palm is a gift divine
Wherein all uses of life combine,
House, and raiment, and food, and wine,"

Ornament the pleasing and fruitful landscape. And as we note the hill slopes adorned with noble forests of chestnuts and walnuts, and the valleys green with vineyards and fair orchards; orchards of pear, prune, apricot, and almond; orchards where peaches glow with sunny dyes, like maidens' cheeks when blushes rise; orchards where pomegranates, rich and sweet, show the print of the sunbeam's feet; orchards where on the grass land, on the fallow, drop the apples red and yellow, may we not apply the thought, if not the exact words of the poet, and say: "This is the land of the orange and vine, where the flowers ever blossom, the beams ever shine." A land so rich, bountiful, and prolific in the most favored fruits for man's use, that all within the borders of our grand and noble State will be proud of it. A region so promising, so hopeful, so assuring, and one in which we have such unbounded faith and confidence, that I would the power were given to us for a moment to sweep aside the dim, opaque, and mysterious curtain that hides futurity and permit us to see California, in all her splendor and crowning glories, as she is destined in reality to appear in all future ages.

FERTILIZATION OF ORCHARDS.

By E. W. HILGARD, Professor of Agriculture and Chemistry, State University, Berkeley.

The subject I wish to bring before you rather briefly, not in a set lecture, but rather in the way in which I like to present such things, and ask you if you desire, to interrupt me and ask questions, is the subject especially of fertilization of orchards. Fertilization is usually a late outcome of civilization in this country. I remember well when I was in charge of the Horticultural Department at the University of Mississippi, that when fertilization was mentioned the usual remark was: "Fertilization is too troublesome, and will never pay." We have learned better since, and it is a great source of gratification that we find in California, long before the State has acquired the age that Mississippi had at that time, that fertilization is beginning to attract great attention. Something is due, perhaps, to the nature of the cultures that are prominent in California. You know that when field crops are cultivated the practice usually is to have some routine, and even the backwoodsman in the Southern or Western States knows that in order to get a good crop of corn he must not plant it to follow other crops of corn, but to put something between them. Now, our wheat planting has in this State progressed to the extent of reducing the first product of about forty bushels to the acre, and in some cases as much as eighty bushels I am told, to an average of about fifteen. That has been done by the consecutive planting of wheat after wheat, and therefore a one-sided use of the land. Where rotation of crops is practiced the use is made much more uniform, as it were, at all points of the soil composition; whereas, where one crop is planted continuously the soil is used up, as it were, on one side, or perhaps two sides, but not on all the sides which it presents to the crop. Now, fruit growing, which is bound to be the prominent industry of California, is necessarily exempt from the possibility of rotation. An orchard and a vineyard are permanent investments which we expect to last, if we know how to manage them, from twenty to forty years. Forty years is not an unreasonable age to expect from vines in particular; we have now vines which are older than that in the State, and there is no reason why a vineyard should not last forty years and over, provided it is properly treated, and has been planted in the right place. Now, then, your crops from that vineyard or from that orchard are constantly one and the same thing; you are withdrawn, as it were, from the possibility of rotation, and hence your land is used up in a one-sided manner, and of course the need of fertilization makes itself felt all the sooner. I am constantly in receipt of letters asking me to recommend what fertilizers to use. Now, the question is a little embarrassing, because while we do know at what points certain crops do use the soil particularly, soils differ so widely in this State and everywhere, and the practice of culture varies so much, that it is not easy to give a general answer to such questions; and to answer each individual farmer who asks those questions is getting to be rather irksome business. I have written during the past year not less than between seven and eight hundred letters on just such subjects, and it occupies a great deal of my time, and I am therefore glad to have an opportunity of saying and giving to a wider publicity a little of what I might say to each one in reply to those numerous letters.

The understanding of the principles upon which the cheapest, and, therefore, the most rational method of fertilization may be based, to a certain extent involve the ingredients which compose the fertilizer. Now, to the chemist these ingredients are generally very well known. The farmer generally hesitates when such names as phosphoric acid, and potash, and nitrogen are mentioned before him; but the farmer must understand distinctly that he cannot avail himself of the aid of science in his pursuit unless he does take pains to understand these so-called "jaw-breakers," and, after all, there are a great many names which are worse. Electricity is a very hard word to pronounce, although you talk of it, and "telegraph" and "telegram" don't come very hard; and therefore not only the word, but the idea of potash, phosphoric acid, and nitrogen ought not to come hard after you once understand it. I lately read a report from one of the Eastern States that the farmers, I think it was in Massachusetts, now talk just as freely about these substances as they do about birds, or dogs, or anything else—and there is no reason why they should not—and you can illustrate the substances very well by reference to articles that there is no difficulty about.

Now, then, to go a little into this matter, all fertilizers that we use, that are furnished cheaply, contain one or several of all of these three substances: Potash, represented by the potashes of commerce; phosphoric acid, represented most readily to you by either the matches of every-day life, or, better, by the bones of animals; and, finally, nitrogen, which is represented in a great variety of ways; probably the most familiar representation of it would be as a large component of the air, which is certainly sufficiently familiar; but to the farmer the source from which he replenishes the soil for the use of the crop is usually one of two things, either ammonia salts or niter—nitrates of some kind—at the present time chiefly the nitrate of soda, which comes to us principally from Chile, under the name of Chile saltpeter. I mention these sources of the ingredients because it is this that we must consider in getting our cheapest supply of fertilizers. There is another substance which it is very essential to have in the soil, and which, if it is not in the soil should be given to it, and that is lime; but our California climate has so managed the soil-making processes, and our rocks are so constituted, that there are very few soils in California that do not contain as much lime as is wanted, and for which there are uses; and lime is always an important agricultural ingredient, yet to put lime in the soil in California is usually like "carrying coals to Newcastle"—it is not needed.

Some time ago, at one of your mountain places here in Santa Cruz, there was a factory established to grind limestone, and they wanted me to tell them where it should be applied, and I told them that if they shipped it outside of California they would probably find they could use it, but inside of California there was probably limestone enough in the soil, and they would have to ship it a distance away from the Santa Cruz Mountains to have any use for it. Therefore, we have this advantage: that our soils are already provided with one of the very important ingredients which, in the Eastern States, is most frequently one of the sources of infertility. I can give you a general idea of this: Take the soils of the Southern States, for example; you are competitors in some respects, but place the average of lime in their soils at something like two tenths of one per cent—I should place the average of California

soils at between $1\frac{1}{2}$ and 2 per cent, so you see we have a long ways the advantage of them in that regard. Taking that for granted, now we are usually aiming to supply one if not two of the three ingredients, potash, phosphoric acid, and nitrogen—what I just now said in reference to lime in California soils, investigations, so far as they have gone—and they have not extended very far north of Sacramento, because people there have not asked for it—we of course do our work just where it is asked for—have shown that in the vast majority of California soils potash is not an ingredient that need be supplied at the present time; it is so abundant in the large majority of soils that when the soil fails to produce what you want, the presumption is not that potash is lacking, but that either nitrogen or phosphoric acid has given out, if the soil is otherwise in good condition. Now, this conclusion is the result of several hundred examinations of California soils which have been made at the central station at Berkeley. We are constantly extending our knowledge in the different parts of the State, and so far I have no reason to think otherwise than that there is, on the whole, a sufficient supply of potash for the present generation, and probably for another generation to come, in our soils. We are, therefore, freed, in a great measure, at least, from looking out for that ingredient furnishing the soil with potash, and phosphoric acid and nitrogen are the two that chiefly occupy our attention.

Now, for a moment go to the principles of fertilization. If from the moment that you start to cultivate the land you were to return annually whatever your crops take away, the land would not only not become poorer, but they would steadily improve. For instance, if you were to sow wheat this year and each year plow the wheat under without taking the grain away, your land would continually increase its production and you would get more wheat every year, but of course you would make no money out of it; you would have your labor for nothing. Now, with wheat you take your grain away in the place of the plant; with crops of potatoes or parsnips you take the roots away; in other cases you take the leaf. It is generally true that if you are to take the whole plant, it makes very little difference which plant, the kind of ingredients taken would not differ very widely, and the difference in the manner in which the crops use the soil, therefore, is dependent chiefly upon the part that you take away. If you take away chiefly seed, the two ingredients that are drawn upon mainly are phosphoric acid and nitrogen. If you take away chiefly the root, or only the root, the ingredient usually drawn upon is potash; other salts will be drawn upon, but the potash is the permanent ingredient. If the leaf is chiefly drawn upon, all of these ingredients to a less or greater extent, and lime, are heavily drawn upon.

Now, then, what you want to do is to put those things back again, and I repeat, if you were to do that from the beginning—and it would be a very judicious thing to do, to keep an account of your soil just as you keep any other account, debit and credit account—if you were to keep an account of your soil from the beginning, and return each year the trifling amount that you take away in your crop, why your soil would never get any worse; on the contrary, it would keep improving its production, but it would require the spending of a little cash, and the man who clears a piece of land of course does not want to do that as long as his soil produces. Then he comes to a point when his crops begin to

decrease in quality and quantity, and now comes the question as to which is the fertilizer that is to be used. Knowing nothing about it particularly, we would say take that which contains everything, namely: stable manure. That is very good advice to give if you can get plenty of stable manure. There is no use of this discussion as long as you can get plenty of stable manure, but to do that is just precisely where the shoe pinches. The old country has been trying to get enough stable manure in some way or another and it has failed, and its farmers are importing their fertilizers from South America and North America and all the countries of the world, because sufficient stable manure cannot be had. And why is that such a universal fertilizer? Because it contains everything that is taken from the soil, and therefore gives it back to the soil. Now, you might say: Why should we not imitate stable manure artificially; why not give back to the soil everything at once—potash, phosphoric acid, and nitrogen? Because if you give them something that is not wanted, you spend something unnecessarily; you are "carrying coals to Newcastle," as in giving lime to California soil you will do; as in giving potash to the soil in the San Joaquin Valley, you would only make alkali worse than it is already. You want to spend as little as possible and to make return to the soil what has been taken from it, and if it has been used in a one-sided fashion, it may be that the return of one ingredient alone will be quite sufficient. Of course the composition of the crops you have taken off gives you a clue from the very beginning, and as this composition is known and can be given you in tabulated form, you can really calculate for yourself just what is necessary to be given back. I published a bulletin not long ago in which this matter was set forth. I have brought a few for you to take, and you will find a table which shows you how much of these three ingredients is taken away by a thousand pounds of grapes, or oranges, or plums, or apples, and so I might go on down through the whole list of crops. By this you will see just how much you would have to put back for each year you have had a certain crop—the simplest thing in the world—and if you have not done that, and very few have, the question is, what must you supply?

[The following bulletin was ordered inserted in Professor Hilgard's remarks by the Board:]

THE USE OF FERTILIZERS IN CALIFORNIA.

(University Bulletin No. 88.)

The fortieth anniversary of the admission of California into the Union reminds us that she has ceased to be a stripling. With this advance in dignity comes the inference that however fertile her soils, it is to be expected that those long occupied or heavily cropped will now require serious care in order to keep up or restore production. That this is really so is proved by the rapidly increasing correspondence on the subject that is addressed to this station; and to avoid the unnecessary rehearsal of general statements in each individual case, it seems desirable to put in print for general information what can be stated in a general way on this subject. Of course many individual cases will still require special consideration on account of peculiar conditions of soil or location; for in a great many instances the failure to produce satisfactory crops is not at all due to soil exhaustion, but to improper physical conditions of the subsoils, unsuitable cultivation or irrigation, alkali, etc. The fact that orchards and vineyards form costly investments of much greater permanence than the annual crops that occupy the vast majority of the cultivated land east of the Rocky Mountains, and the high returns so often realized from them, has brought the manure question forward here much earlier than has usually been the case in the United States; and happily the silly adage that "manuring is too costly and will never pay," which has long kept agriculture on the down grade elsewhere, has never had a serious foothold in California. The sovereign truth that nothing pays worse than poor crops, upon large areas of which the cultivation costs just as much as if it were

yielding high returns, is quite generally appreciated here. Cultivating too much land poorly, and getting poor returns both as to quantity and quality, has been the bane of farmers all over the East, and has doubtless done at least as much toward "agricultural depression" as all other causes combined.

But whether fertilization will pay or not clearly depends directly upon the particular requirements of each soil. Unlike Europe, where long cropping has reduced all soils alike to a condition when they require an "all-around" fertilizer, the soils of California have mostly had only a *one-sided wear* from the constant succession of one and the same crop. In orchards and vineyards this state of things is unavoidable, since they are expected to last twenty to forty years without renewal and possibility of rotation of crops. It is this one-sided wear, inseparable from the chief horticultural industries of the State, that requires special attention at this time; for it is clear that to apply "complete" fertilizers in these cases would be to pay out a portion of their cost uselessly, since nothing can be gained by adding to the soil more of the ingredients that are already abundantly present in an available form.

In order to fertilize intelligently we must know, first of all, what ingredients are chiefly drawn upon by the crop sold off the land; secondly, we must know which of these ingredients are so abundantly present in the soil (or irrigation water, as the case may be), to render their replacement unnecessary for the present at least.

The subjoined table* gives some insight into the amounts removed from the soil by some of the chief fruit crops, of nitrogen, potash, phosphoric acid, and lime; these being, according to all experience, the only ones of which the replacement need ordinarily be considered in fertilization. These amounts are expressed both with reference to one thousand pounds of fresh fruit, and to what, according to our best information, may be assumed to be a "fair crop" per acre. The latter figure is, of course, liable to great variations and differences of opinion; but by the aid of a little arithmetic each one can calculate for himself the data suitable to his own case or views. The crop assumed in the case of oranges is three hundred and twenty-five boxes per acre of fifteen-year-old trees; that of grapes is intended to represent a mean between upland and lowland.

Quantities of Soil Ingredients Withdrawn by Various Fruit Crops.

FRESH FRUIT.	Total Ash— lbs.	Potash—lbs.	Phosphoric Acid—lbs.	Nitrogen— lbs.
Grapes, 1,000 pounds.....	8.80	5.00	1.52	1.70
Crop of 10,000 pounds per acre.....		50.00	15.20	17.00
Oranges (seedless), 1,000 pounds.....	6.07	2.78	.67	2.69
Crop of 20,000 pounds per acre.....		55.60	13.40	53.80
Pears, 1,000 pounds.....	3.30	1.80	.50	.60
Crop of 20,000 pounds per acre.....		36.00	10.00	12.00
Plums, 1,000 pounds.....	2.90	1.72	.44	4.20
Crop of 30,000 pounds per acre.....		51.60	13.20	167.70
Apples, 1,000 pounds.....	2.20	.80	.03	.60
Crop of 20,000 pounds per acre.....		16.00	6.00	12.00

It will be seen that for equal weights of these fruits, *grapes* take from the soil by far the largest amount of mineral matter, of which nearly five ninths is potash; they also carry off the largest amount of phosphoric acid. For seedless grapes the latter item would, however, be considerably smaller.

Next in the drain of total mineral matter from the soil stands the *orange*; it also draws heavily on the potash, and also upon the nitrogen of the soil, but less than the grape upon phosphoric acid. This, independently of the seeds, the analysis having been referred to seedless fruit; seed-bearing (seedling) fruit would draw more heavily both on phosphoric acid and nitrogen.

Pears come next, as regards total mineral matter, but draw quite lightly on nitrogen. *Plums* (including prunes) are conspicuous chiefly for their heavy draught on the nitrogen of the soil, greatly exceeding in that respect the orange, for equal weights, and enormously for an (assumed) average crop.

The difference between *apples* and *pears*, in respect to soil exhaustion, for an equal weight of fruit, is quite striking—the amount of potash in apples being less than half the phosphoric acid only a trifle over half as much as in the pear, while nitrogen is equal in both, and quite low, as compared to the orange, which has over four times as much, and must, therefore, be accounted relatively much more nourishing to man, as well as more exhausting to the soil.

While the data given above in relation to the "out-go" of soil ingredients through the harvesting of the several fruits may be considered as holding good, practically, in all countries and on all soils, the vast differences in the nature and composition of *different soils* introduce an element of uncertainty as to the need of returning to every soil the full

* The analyses of ashes here given are mostly those of European chemists, generally accepted as representing averages. California-grown fruits will be investigated at this Station the coming season for this purpose.

amount of the outgoing ingredients. Few soils are about evenly constituted with respect to the four important plant-food substances; there is in most cases one or several of these present in superabundance, so that to replace the small amount carried off by the crop would be as useless as "carrying coals to Newcastle," at least for the present. *The analysis of soils and irrigation waters is necessary to gain information on these points.*

As regards waters, the information so obtained is positive and unimpeachable. Whatever is dissolved in the irrigation water is absolutely available to vegetation, and the amount annually so conveyed to the soil is capable of close calculation on the basis of the current practice of each irrigation district. If the amount of any substance so given to the soil approximates to or exceeds the amount withdrawn by crops, it is quite certain that no moneys need be expended in the purchase of that particular substance as a fertilizer.

As regards soils, the indications given by chemical analysis are not so definite, because the acids used in the laboratory are more powerful than those at the command of the roots of plants; although some of the latter (*e. g.*, oxalic acid, that of sorrel, rhubarb, etc.) approximate closely to the same solvent power. Here experience must be our main guide; and this has shown that practically soils containing (by the results of analysis) more than a certain percentage of a given substance, may be considered as abundantly supplied with the same; while if the percentage so indicated falls below a certain other point, such ingredient may be considered as being deficient. The crucial test in either case is the experimental use of that substance as a fertilizer on the soil in question; when it fails to produce a definite favorable result, it may be considered that the native supply is sufficient, and *vice versa*.

It is obvious that in order to secure to the farmer this saving of the purchase of superfluous fertilizing ingredients, a comprehensive system of investigation of soils and waters is necessary. This has been from the outset the central thread of the work of this Station, the object being to obtain as quickly as possible the facts necessary for the compilation of a soil map of the State. For want of funds for field work, and too limited a force for the laboratory work, this fundamental plan has been carried out only to a limited extent and chiefly in certain regions where considerable interest in agricultural improvement was manifested. We are not, therefore, as yet prepared to give information as to the entire State; and unless some special provision is made, it will be long before this can be the case. But so far as the work has gone, the following points may be considered as practically settled:

1. From climatic as well as geological causes, nearly all the soils of the State may be considered as abundantly supplied with *lime*. The chief exceptions occur in the higher portions of the foothills, where the rainfall is high and summer rains occur. In *all* the valley soils lime is abundant; and liming is therefore not among the means of improvement usually to be thought of in California. This applies to the use of quicklime and ground limestone, not necessarily to the use of marls, which usually contain other ingredients besides lime to render their use valuable, where it can be done with little cost.

2. Almost the same that is stated above of lime may be said of *potash*. The great majority of soils in this State, more especially nearly all valley soils, and absolutely *all* soils in which there is the least manifestation of alkali, contain an abundance of available potash for all agricultural purposes; so much so that dissolved potash salts frequently circulate in the soil water. Most irrigation waters furnish an additional supply, sometimes enough of itself to make up for all that crops take away. Outside of the rainy belts of the Sierra and of the northwest coast, therefore, the addition of potash in fertilization must in general be considered in the light of "carrying coals to Newcastle"—superfluous and unprofitable at the present time; and farmers should object to paying for the potash in commercial fertilizers (put there under the Eastern idea of making a "complete" fertilizer), because the investment will pay them no interest. They should demand for their money the ingredients that will pay them for their use in this State, regardless of what may pay elsewhere.

The few cases in which at present the use of potash *will* pay, are those of intense culture in vegetable gardens and berry patches, where crops are grown continuously and successively throughout the season. Here the draught upon the soil ingredients is so heavy that within a few years *all* require current replacement.

3. Of *phosphoric acid*, an ingredient so important that even in Europe it is beginning to be claimed as the practical measure of fertility, analysis has shown an almost universal *scarcity* in the soils of this State; always excepting the alkali soils, in which it, or its compounds, frequently circulate in proportionally large amounts. Phosphoric acid is one of the substances to be first suspected of exhaustion in the non-alkaline soils of California; it is, therefore, an ingredient that should be prominent in *all* compound commercial fertilizers, and which will be found to "pay" in most cases of decreasing production.

4. As to the fourth of the critical soil and plant ingredients, *nitrogen*, its ordinary measure in soils is the vegetable mold or humus, the presence of which is generally manifested, and outside of "red" soils is fairly measured, by the more or less blackish tint when wetted. From climatic causes humus is rarely abundant in the upland soils of the State, and very generally its amounts may be said to be small. This is especially true of the mesa soils of the South—those best adapted to the growth of the citrus fruits—and hence it is reasonable to suppose that a *lack of nitrogen* will be among the first things to be apprehended when that fruit shrinks in size, and production fails on these soils.

Elsewhere stable manure is the ordinary source of this as well as of the other substances when required only in moderate amounts; but for many reasons stable manure is less available in the dry climate of California than elsewhere. It is produced only in small quantity in horticultural communities; and when put in the soil it is long in decaying and becoming effective. It should for our climates be systematically "cured" in the manure pile before being used—a point of vantage which explains, in part, the good effects of sheep-coral manure.

By far the most convenient, and at present certainly the cheapest and most available source of nitrogen at command of the farmer, is *Chile saltpeter*, which contains about 16 per cent of nitrogen in its most effective form. From one hundred and fifty to two hundred pounds per acre is the usual dose; more than this will not be used by the crop plants in one season, and a surplus is likely to be washed out of the soil by the winter rains. Moreover, an excessive application might result in too much wood and too little fruit, and that fruit of a sappy, flavorless character, though of large size.

Sulphate of ammonia is the other most available source of nitrogen obtainable in commerce; a good commercial article contains 20 per cent and over of nitrogen. It does not, however, act quite as rapidly as the *Chile saltpeter*.

To the citrus growers, then, who at present appear to be most concerned about the fertilizer question, I would say that, well-cured stable and sheep-coral manure apart, their best resort at present is to the commercial phosphates and superphosphates of high and honest grade, mixed, either by themselves or by the manufacturer, with a proper proportion of *Chile saltpeter* or ammonia sulphate, and generally no potash whatever. In order to cover approximately the ground of the questions most commonly propounded in our correspondence on the subject of fertilizers, the following points are briefly stated:

This Station has no direct or definite knowledge of the quality or "trueness to name" of any of the commercial fertilizers now sold in this State. Analyses of mere samples sent by the manufacturers or others prove little or nothing, so long as no regular "fertilizer control" is established by State authority. That this should be done as soon as possible, in the interest both of the users and honest manufacturers of fertilizers, is manifest; and nearly all the older States have found this regulation of the fertilizer trade necessary long ago. At present this Station declines to analyze and certify to the composition of fertilizer samples, except in cases of suspected fraud; for the reason that such samples prove nothing as to the general quality of the material put on the market, and their analyses have been used in advertising as though offering a kind of guarantee or recommendation on the part of the Director. The latter disclaims pointedly any such responsibility, and does not authorize the use of his name in connection with any fertilizer advertised. He has, however, no reason to question the *bona fide* character of the several fertilizers manufactured in this State. That in individual cases disappointment must often occur, is natural from the causes stated above, and proves nothing against the honest composition of the goods. In this, as in other cases, the right thing may be put in the wrong place. The useless addition of considerable potash is the objection lying against several of the brands in the market.

Farmers should be willing to pay a good price for a high-grade fertilizer, especially in the case of superphosphates. The only consequence of insisting on too low a price is that the manufacturer, in self-defense, adds to the active matters enough of some cheap inert material to be able to afford the lower rate; the result being that the farmer pays freight, to say the least, on "dirt" which he might as well put in himself on the spot, if so inclined. "Spent refinery charcoal" in coarse grain is about as unprofitable an investment as a farmer can well make; he should be willing to pay enough to justify the manufacturer in reducing every grain of it to the soluble form by the use of enough sulphuric acid. It is not advisable for any one to attempt to do this at home.

In regard to the use of bones, it may be said that any one may, with little trouble, use all the bones accumulating about a homestead in either of three ways:

1. Bones put into a *well-kept* (moistened) *manure pile* will themselves gradually decay and disappear, enriching the manure to that extent.
2. Raw bones may be bodily *buried in the soil* around the trees; if placed at a sufficient depth, beyond the reach of the summer's heat and drought, the rootlets will cluster around each piece, and in the course of a few years consume it entirely. But it will not do to have these root-clusters broken up by cultivation every season.
3. Bones may be packed in moist wood ashes, best mixed with a little quicklime, the mass kept moist but never dripping. In a few months the hardest bones will be reduced to a fine mush, which is as effectual as superphosphate. "Concentrated lye" and soil may be used instead of ashes. In this process the *nitrogen* of the bones is lost, going off in the form of ammonia, the odor of which is very perceptible in the tank used.

For neither of these processes should the bones be *burnt*. The burning of bones is an unqualified detriment to their effectiveness, which can only be undone by the use of sulphuric acid.

4. Bones *steamed* for three or four hours in a boiler under a pressure of thirty-five to fifty pounds, can, after drying, be readily crushed in an ordinary barley-crushing mill, and thus be rendered more convenient for use. Practically very little of the nitrogen (glue) of the bones need be thus lost.

Very good *bone-meal* is found in the market at reasonable rates. For information concerning the value and proper uses of *land plaster* or *gypsum* (also one of the inquiries continually made), I refer to pages 144 and 145 of the "Report on the Experiment Stations," lately issued, which will be mailed free to any one desiring it.

may here simply be stated that while gypsum is not a general fertilizer like the phosphates and nitrates, for the simple reason that it does not contain, and therefore cannot supply, the plant-food substances of which the withdrawal by crops causes sterility; yet its uses, especially in the irrigated regions and on alkali soil, are so many and so important, that it should be very widely used so soon as a reasonably cheap supply can be obtained.

One of my objects to-day is to give you some idea of how you can get at it. In the first place you have fertilizers offered you as complete fertilizers in this State, nearly all containing potash, and of course you would put them off; now, seeing that very few of you will need any potash—and why should you pay for what you do not need—the fertilizers for this State, at the present time at least, should contain, in the main, nitrogen and phosphoric acid, and these two you have reason to pay for, and the rest you don't have reason to pay for. Of course you have to trust in that regard the representations of the manufacturer or the vender of the fertilizers. We understand pretty well what are the specific effects of the substances, and all the information I can give you is to come to your own conclusions in regard to the possible deficiency that causes a diminution of your crop, because, unless your crop has diminished, of course you have no call at all for phosphoric acid; when the deficiency in the soil, generally speaking, causes a failure to fruit in this, that there is a deficiency to set or that the fruit is small, while it may be numerous, and when the fruit is small and fails to develop properly, and especially has a great many unsound kernels, the reason is that phosphoric acid is one of the chief ingredients necessary in the formation of seed, and without it seed cannot be formed. I had a case reported to me from the foothills of Santa Cruz, on the other side, some time ago; an orchard of prunes which produced very large crops for some time, and still produced a very large number of prunes, but they were too small to be salable. Now, in this case the seeds were perfect; what was lacking was the flesh. Clearly it was not in that case the phosphoric acid that was lacking, because from the formation of the seed evidently there was an abundance; it was something else that was lacking; that substance is not phosphoric acid, but nitrogen and potash, and in that case I advised immediate use of *Chile saltpeter* or sheep manure if it could be had. I do not know exactly what the result was, it has not yet been reported to me, but I have no doubt the application in that case of *Chile saltpeter* would produce precisely the effect wanted, without diminishing the number of the fruit to increase the size, or perhaps diminish the number of the fruit somewhat and increase the size of each one, which is what you want. The effect, then, of a lack of nitrogen in the soil would be, if there was plenty of phosphoric acid, to increase the size of the fruit, while the fruit was still setting, but when it blooms abundantly and fails to set you may conclude that there is a deficiency of phosphoric acid, and then is the time to buy it.

From Southern California I hear that oranges have been produced in great abundance, and of large size, for a certain period, and all at once the oranges begin to diminish in size, and they get dry. Now, in the case of oranges, this table will show you just what they consume: Seedless oranges would consume, in 1,000 pounds of fruit, 2½ pounds of potash, a little over a half a pound of phosphoric acid, and 2.7 pounds of nitrogen. You see, oranges bear substantially on potash and nitrogen, and phosphoric acid is not needed. Why? Because we speak of seedless oranges—the seedless Navel drawing mainly on the two ingre-

dients. If, on the contrary, you have oranges which usually have plenty of seeds, a little more would be required of the phosphoric acid; still, when you sum up a crop per acre of 20,000 pounds, which is what is claimed by the authorities down south, you will have 55½ pounds of potash, 13½ pounds of phosphoric acid, and 53.8 pounds of nitrogen. Now compare that with what would be taken away by a crop of prunes. I have had very great difficulty in coming to any conclusion, because the figures given me vary all the way from 150 to 1,000 pounds of the average crop per tree, and I have put it as a crop of 30,000 per acre as something that might be agreed upon between the San Joaquin Valley on the one hand and the Santa Clara Valley on the other. I don't swear to that, but if you were to compare crops of equal size, equal magnitude, the prunes would take away, instead of the 53 or 54 pounds that oranges do, 167 pounds of nitrogen—nearly three times as much—while in the matter of potash they come very nearly to the same point. Now, I shall not bother you more with figures of that kind, because those are things which cannot be properly dealt with in a mere lecture. You ought then, as a regular rule, to keep account of your soil—what you do draw from it, on the basis of the well-known composition of crops—and by that you will be able to base some idea of what is lacking, and you may, by experiments on a small scale, soon find out whether it is so or not. For instance, you need not use Chile saltpeter by the ton; if the size of your fruit is decreased, use it on half a dozen trees.

Now, I have been told that it is desired I should give you some idea of the manner of using these things, and the reason I speak of the specific giving of these substances is simply this: there is here, in this State, no control of fertilizers. In all the Eastern States there is a State control of fertilizers, and they do not permit the sale of fertilizers before they have been inspected, an analysis made, and a certificate issued by the inspector or chemist. Without that, it is found that the fertilizer trade is entirely too tricky to be of permanent good to the country, and while I believe that most of the fertilizers now sold in California are of good quality and as represented, yet I think that until State control of fertilizers is established it will be better for the farmers who want to know exactly what they give their land to adhere to fewer materials that they can get in the market; and for nitrogen, which is one of the most essential to be used, Chile saltpeter is a substance which never changes in composition; it contains about 15½ or 16 per cent of nitrogen, and upon that you can always count, and an application of that to the soil would be at the rate of about one hundred and fifty pounds to the acre; not very much, you see. It will cost you at wholesale at this time, I imagine, about 2½ cents a pound, and in the general form in which it is used you must not use it before the winter rains, because it washes all through the soil; you must use it at the time when it is wanted, in the spring, prior to the leaf coming out, but still not when you expect rain enough to wash it through the soil. In regard to those who use it with irrigation, they must be careful to give their irrigation before using it, and then simply irrigate it in after the need of very heavy irrigation is over, because it is a substance which does not stay in the soil very long, and what you put in as a surplus one year is lost the next year, and there is no justification for putting in more than just what is wanted for the crop, and that is, to repeat, about an average

of one hundred and fifty pounds an acre—sometimes one hundred will do and sometimes two hundred is desirable; that you can find out afterwards. Now, Chile saltpeter is an ingredient in many of the commercial fertilizers, but you never know how much there is without an analysis is made. Probably the analysis given here is correct, but still you would want to know exactly what you get when you purchase that substance.

For phosphoric acid the substance you can always use is bones in some form, bone-meal. Bone-meal is so easily tested as to its purity by the eye, by any one who is willing to use his eyes, that very little deception can be practiced with it. You can increase its efficacy by mixing it with stable manure; but, put in by itself, it is exceedingly effectual, and it stays in the soil almost indefinitely; in other words, in two years until used. In regard to the use of bones, there are many ways in which you can use them without grinding—without paying anything for making them smaller. The way I do in my own place is simply to get them into the ground there alongside of the trees; the trees take care of them. If you put them in the ground about twelve inches you will find by the end of the season that they are completely decomposed; the bone is completely covered by a network of roots, and you must not dig up that network of roots with the plow every year; you must put it down out of the reach of the plow, and in three or four years that bone will be completely taken up by the tree. Or you may place the bone, if you have time, in your manure pile; in the course of a year, or sometimes six months, or sometimes three, depending upon how you keep the pile, the bone will disintegrate and you will see nothing more of it. It enriches and forms part of the manure.

Again, you may put a bone with common ashes into a tank and leave it there; simply moisten the ashes, and in the course of several months it will be reduced to a mush, and that mush is as good as any phosphate fertilizer you can possibly buy. It is in an exceedingly fine state, and is almost as effectual as any superphosphate of commerce you can purchase. These are means by which you can utilize your bones, and as soon as there is a general demand for these fertilizers the home supply of bones becomes insufficient; you must then resort to the superphosphates of commerce, and there is where I think the State must take action, as quickly as possible, to get such supervision as will insure the farmer getting what he pays for; for while the honesty of many of our houses is unquestioned (I believe fully that they mean what they say they do), yet I have been led to refuse absolutely to analyze any of these fertilizers for any of these houses for the simple reason that my signature has been taken as a kind of guarantee of what the material is supposed to contain. Now, when they send me a sample to analyze it, I cannot vouch for what the next sample will be, and yet I have received complaints that the fertilizer did not act as it should according to the analysis which was certified to by me. Now, the purchaser ought to have known better than to suppose that because I said that I had analyzed a sample sent to me by such and such a house, that therefore I guarantee the composition of their goods; but still, inasmuch as it has been done, I simply have declined to sign my name to anything of the kind. When people have come to me—consumers—to determine whether or not a fertilizer is misrepresented, why, I have made the tests, but I will not put my name to certify to anything until a State control establishes that the signature can mean something by which there can be no mis-

take. I think those who are interested in fertilizers ought to try and get the next Legislature to establish that which is now established in nearly all the Eastern States. There are only a few States now east of the Mississippi that do not have State control; it is found to be a necessity and ought to be established here.

Now, I do not know that I shall detain you longer with a general discussion of this kind. I would rather that those who desire to know more about it should ask such questions as they may wish to ask with reference to their particular position; but I will add this: I have said before that one of the advantages of our soils is that they contain nitrogen, two of the ingredients which are important to all the soils, namely: lime and potash, and I should add to that that a great many of our irrigation waters contain potash, and each time you give it a year's irrigation you supply enough potash to supply any ordinary crop; some of the irrigation waters of Southern California are fully up to that standard. The ordinary Riverside irrigation water would contain in an ordinary year's irrigation three fourths of the amount of potash that is consumed by the orange crop. The advantage of this to the cultivator is obvious; he gets not only his water, but he gets a considerable amount of fertilizer with it, and it makes quite a difference to him whether or not he irrigates with rain water, or with water that is worth perhaps \$4 or \$5 in the way of fertilizers. A good many of our irrigation waters are of the same character, and it is one of the advantages of irrigation that nearly all the waters of California bring with them a very notable amount of such fertilization. That is one reason why irrigated lands hold out longer than the others.

DISCUSSION ON FERTILIZING.

MR. BLANCHARD: I would like to ask Professor Hilgard how the lemon compares with the orange in the ingredients that it takes from the soil?

MR. HILGARD: So far as I have known, these things have not been as fully investigated as desired, but there is probably no great difference between oranges and lemons except this: that the lemons always contain plenty of seeds, and therefore draw more heavily on phosphoric acid than the orange. It is not probable that there is any essential difference between the two.

QUESTION: Do you recommend putting lime on heavy soil, or where it is inclined to be a little adobe?

MR. HILGARD: Well, the black adobe, the dark-colored adobe, usually contains as much lime, a good deal more than you can put on it with any reasonable expense. I can speak of my own vineyard at Mission San José, which is partially, I am sorry to say, black adobe, and which I have analyzed; it contains no less than 3 per cent of lime. Now, if I were to try to put that on the soil it would probably cost me a good deal more than the land is worth, and what I could add to this would be a fraction, say one tenth of one per cent, which, in fact, would amount to nothing—it would be carrying coals to Newcastle. With the white adobe it is quite a different thing, and often the lime is deficient and an addition to it would be advantageous. Of course mere gener-

alizations will not hold good in every case; there are cases where lime is deficient even in California, but they are few and far between.

MR. MOSHER: In some of this black adobe we find a good deal of clover, much more than others; would there be more lime in one than in another?

MR. HILGARD: Clover generally signifies plenty of lime, and where you find that the clover suddenly ceases and refuses to grow, you will generally find a benefit from the use of lime. You find that the instance where you take tule land, which is usually acid; as quick as you put lime on it clover will spring up naturally; but in the East, where generally lime is scarce, if you find clover growing abundantly you find usually a calcareous soil.

MR. MOSHER: I ask that because in our county (Santa Clara) there is a good deal of rich, dark soil, and it is near enough to get plenty of this soft lime for almost nothing, and there are a great many people in our neighborhood who would like to know in regard to that.

MR. HILGARD: You will frequently find that the use of this natural lime—this marl—is efficient, not because of the lime it will carry, but other things. A good deal of this Santa Cruz limestone carries a good deal of phosphoric acid and other things, even potash, which is desirable; so that these marls are useful, not for lime alone, but for something else. As a rule, the black adobe is so full of lime that very little good can be done by the use of marl.

MR. BERWICK: We had some discussion as to the use of copperas as an insecticide around trees. How much could be safely used in the ground to kill the woolly aphis around the trees?

MR. HILGARD: It is hard to say without knowing something about the soil. In a sandy soil you must use very much less than in a clay soil.

MR. BERWICK: How much copperas would poison the tree as well as the insect—a stout, vigorous tree, ten years old?

MR. HILGARD: That is a hard question to answer. It would depend upon the concentration of the solution. You could doubtless put three or four pounds around the tree, if you scatter it well, without hurting it materially, because it very soon becomes something else than copperas; it does not stay in the soil any length of time.

QUESTION: Will you tell us how to apply the Chile saltpeter?

MR. HILGARD: In regard to the matter of applying it, Chile saltpeter is an exceedingly soluble substance; it takes very little water to dissolve it; in fact, if you expose it to the moist air it becomes liquid of its own accord. The best method is to sprinkle it over the soil generally—not just to put it around the tree, but scatter it around and over the soil of the orchard, if the orchard is old; if the orchard is young, it is best to put it around. The quantity I have stated would be for a full-grown orchard.

NEXT PLACE OF MEETING.

MR. KELLS: I beg to offer the following resolution:

Resolved, That we request the State Board of Horticulture to discontinue the spring Convention, and that the next Convention be held at Marysville.

Adopted.

MEMORIALS TO THE LEGISLATURE.

W. H. AIKEN offered the following memorials to the Legislature of California:

To his Excellency the Governor of California, and the honorable the Senate and Assembly of the State of California, in Legislature assembled:

Your memorialists, the fruit growers of California, in Convention assembled, this twenty-first day of November, 1890, at Santa Cruz, most respectfully represent:

That the climate and soil of this State are adapted to the growth and preparation of fruits of good quality and in quantities sufficient, eventually, to supply the demand for such products in the United States, especially prunes, raisins, figs, olives, and olive oil. The success of this enterprise is of the greatest importance to the State and nation.

That the spread of scale insects from foreign countries in California threatens the continued successful cultivation of fruit trees subject to their ravages. Parasites have been found in foreign countries—especially Australia—that live upon and destroy the scale. Your memorialists, therefore, respectfully and earnestly request an appropriation that will enable the State Board of Horticulture to import to this country parasites for scale insects.

That the Secretary of this Convention shall transmit this memorial to the Legislature as soon as convened.

Adopted.

To his Excellency the Governor of California, and the honorable the Senate and Assembly of the State of California, in Legislature assembled:

Your memorialists, the fruit growers of California, in Convention assembled at Santa Cruz, this twenty-first day of November, 1890, most respectfully represent:

That the State Board of Horticulture has rendered very important and valuable services to the State of California, and this Convention respectfully request that the same appropriation be made for the uses of the State Board of Horticulture for the two years from July 1, 1891, that was made for the past two years.

Adopted.

To his Excellency the Governor of the State of California, and the honorable the Senate and Assembly of the State of California, in Legislature assembled:

Your memorialists, the fruit growers of the State of California, in Convention assembled at the city of Santa Cruz, this twenty-first day of November, 1890, respectfully represent:

That they are engaged in fruit growing, an industry of great importance to the State. That more stringent laws should be enacted to protect and promote horticulture. The Legislature is urgently requested to protect and promote the horticultural interests of the State by such legislation as shall be deemed advisable and effective.

Adopted.

REPORTS OF COMMITTEES.

MR. PRESIDENT: Your committee to whom was assigned the duty of examining and reporting upon the display of fruits and flowers made in connection with this Convention, and to make suitable acknowledgment for the hospitality and favors extended to us as guests of the city, beg leave to report as follows:

The exhibition, while necessarily small from lack of room, calls forth our especial commendation for the artistic manner of the display, and for the variety and excellence of the fruits and flowers produced at this season of the year. While it would be inexpedient to mention each of the very creditable collections, we deem it proper to make favorable mention of the following:

D. C. Fesley, Santa Cruz.—Mountain grapes; varieties: Muscat, Black Morocco, Black Malvoisie, Verdal, Cornichon, Mission, White Nice, Flame Tokay, Muscatelle, Gordo Blanco, Emperor, and Black Ferrara.

A. P. Hendon, Santa Cruz.—Seven varieties of apples, unnamed.
Dakin & Loomis, Laurel Glen Fruit Farm.—A large display of apples and grapes, clean and healthy. Not being a committee on nomenclature, we regret the partial absence of labels from this excellent collection.

M. Denicke, Fresno.—Display of sun-dried White Adriatic figs in layers; fully equal, if not superior, to the best from Smyrna.

A. B. Van Arsdale, Yuba City.—Sun-dried White Adriatic figs, from two-year old trees.
G. W. Carpenter, Sutter County.—Raisins, loose and in layers; of excellent quality.

J. A. McMillan, Church Point.—Brown Turkish figs.
Noah G. Rogers, Los Gatos.—California prunes and Moorpark apricot, sun-dried. These are unsurpassed in quality and appearance by any we have seen.

The Mosher-Craig Company, San José.—The largest, most varied, and best exhibit of

mechanically dried fruit. In this collection are pears dried two years ago, and still in an excellent state of preservation.

Ediz Gillett, Nevada City.—D'Ente and Mont Barbat prunes, and Marron Combale chestnut. The prunes are an excellent imitation of the French method of preparing dessert prunes.

Thomas Slaughter, Santa Cruz.—Sun-dried and evaporated prunes, apples, and plums. We call special attention to the whiteness and flavor of the apples, on which no sulphur was used.

J. P. Onstott, Yuba City.—Display of Thompson's Seedless grapes and raisins. We find them larger and superior to the Sultana.

J. S. Young, Hazel Glen Ranch, Santa Cruz County.—A most excellent display of apples; varieties: Wine Sap, Rhode Island Greenings, Red Pearmain, Jonathan, Newtown Pippin, Spitzenberg, Lady, Yellow Bellflower, Baldwin, and Smith's Cider.

W. W. Watermain, Fair View Farm, Laurel, Santa Cruz County.—A fine display of Verdal, Flame Tokay, Mission (one cluster weighing five pounds), and Muscat of Alexandria grapes.

H. B. Pilkington, Loma Alta Farm.—A very creditable display of apples; varieties: Spitzenberg, Newtown Pippin, White Winter Pearmain, Fall Pippin, Bellflower, Red Pearmain, and Smith's Cider. In this collection we notice a basket of miscellaneous fruit, containing very fair oranges.

Mrs. L. U. McCann, Santa Cruz.—A very unique and tasteful display of small fruits. Here the raspberry, the blackberry, and the strawberry (than which God might have made better fruit, but never did) are seen growing and ripening on the canes and vines. The question has been asked, "What can woman do?" We answer, "She can raise the best of fruits and make the best of speeches; what more would you have her do?"

A. Noble, Rosedale.—Display of White Winter Pearmain, Virginia Greenings, Red Pearmain, Yellow Bellflower, Wine Sap, Newtown Pippin apples, and a wonderful and brilliant display of chrysanthemums of new and choice varieties.

T. Thompson, Santa Cruz.—A most pleasing and attractive collection of camellias, ferns, palms, tuberoses, chrysanthemums, and other rare plants and flowers. The camellias deserve particular mention, as the observed of all observers.

Time and space fail us or we would mention more fully the Easter Beurré pears of C. C. Miller, of Santa Cruz; the cluster of Japanese persimmons (seventeen on a twig), from a tree fifteen years old raised from seed, by Samuel Kellett, of Calistoga, Napa County; the seedless raisins, peaches, and apples of L. Wietz, of Farmington, San Joaquin County; the apples, pears, and persimmons of Mrs. D. W. Thompson, of the Big Pear Tree Farm; the Chance Seedling apples of C. C. Miller, of Santa Cruz County, grown without cultivation, irrigation, or pruning; the Yellow Newtown Pippins of L. Mason, and the Baltimore Reds of Lawrence Ollason, of Pajaro; the pampas plumes of O. H. Bliss, of Santa Cruz; Curious Medlers of C. Steinmetz; the excellent Eureka lemons of N. W. Blanchard, of Santa Paula; apples and pears of Doyle & Harmon, of Santa Cruz; Dr. O. L. Gordon's bunch of green oranges; the Manzanillo, Nevadillo Blanco, Redding Picholine, and Mission olives rooted from top cuttings by Geo. H. Kunz, of Sacramento; the beautiful orchid water lily (*Pontederia*) of Mrs. W. H. Miller; the exquisite hydrangea of Mrs. Hattie Curtis, of this city, and the chrysanthemum pillow of Mrs. Keville, of this city.

A device for conveying fruit from the tree to the ground, invented by J. A. Chapman, of Lakeland, Florida, and presented by N. H. Clafin, of Riverside, is worthy of special mention, as are also the paraffine paper and the Bean spray pump; but we must stop somewhere.

For the Santa Cruz "Daily Sentinel," "The Daily Surf," for their excellent reports of this Convention; for the Southern Pacific Railroad Company, for reduced rates; for the hotels of Santa Cruz, for reduced rates and excellent accommodations; for the Young Men's Christian Association, for the use of this cozy and comfortable Assembly Room; for Mayor Bowman and Judge Aiken, who have contributed so much to the success of this Convention, and for all the good people of Santa Cruz, and especially the ladies, for the freedom of their city, their good will, constant, kind attention, and generous hospitality, we bespeak the heartfelt thanks of this Convention, and extend our best wishes for their future happiness and prosperity.

To our honorable President and Secretary, for their indefatigable zeal and labors in our behalf, we return most grateful thanks, and wish them both long life and ever increasing happiness in the pursuit of horticulture.

H. C. DILLON, Los Angeles County,
GEORGE J. MITCHELL, Los Angeles County,
HIRAM HAMILTON, Orange County,
R. C. KELLS, Sutter County,
FRED. C. MILES, Placer County,

Committee.

Adopted.

REGISTRATION OF PLANTS.

MR. PRESIDENT: Your Committee on National Registration beg leave to report, and recommend the adoption of the following:

Resolved, That we, the fruit growers of this State, in Convention assembled, do heartily

indorse the action of "The Joint Committee upon the National Registration of Plants," and their efforts in behalf of the horticulturists and florists of this State. We urge them to prepare, at an early day, and present to Congress, a bill to establish, under the Department of Agriculture, a division having in charge the nomenclature and registration of all commercial plants and plant life.

All of which is respectfully submitted.

ALFRED T. PERKINS,
R. C. KELLIS,
B. M. LELONG,
Committee.

Adopted.

COOKE MONUMENT.

MR. PRESIDENT: The committee appointed by this Convention at Chico, in 1888, and granted further time at the Convention held at Fresno in 1889, in the matter of a monument to the late Matthew Cooke, wish to report as follows:

Would recommend that a monument be erected by the fruit growers of California to the memory of the late Matthew Cooke. That the expenses of the monument be provided for by subscriptions by the growers as a body. That a committee be formed to receive subscriptions from the fruit growers for that purpose, and that the committee have the general supervision of the funds and the building of a monument.

Respectfully submitted.

WILLIAM JOHNSTON,
Chairman.

NEW COMMITTEE.

The President appointed Wm. Johnston, of Courtland, E. Booth, of Roseville, and Samuel McKinley, of Los Angeles, as the committee to receive subscriptions towards a monument to the late Matthew Cooke.

VOTE OF THANKS.

MR. BERWICK: I hold in my hand a book—the report of the State Board of Horticulture. This book, I think, would be a credit to any State Board of Horticulture. I feel proud to see a book of that kind in California, and I want to add a vote of thanks to the State Board and to Mr. Lelong for publishing so valuable a report for the benefit of the fruit growers of this State; and I move you, sir, that the thanks of this Convention be tendered to the State Board of Horticulture and to Mr. Lelong for the work that they have given us.

Adopted.

The Convention then adjourned *sine die*.

B. M. LELONG,
Secretary.

TRANSACTIONS

OF THE

FIFTEENTH STATE FRUIT GROWERS' CONVENTION,

HELD AT

MARYSVILLE, NOVEMBER, 1891.

TRANSACTIONS
OF THE
FIFTEENTH STATE FRUIT GROWERS' CONVENTION,

HELD UNDER THE AUSPICES OF THE

STATE BOARD OF HORTICULTURE, AT MARYSVILLE,
NOVEMBER 17 TO 20, 1891.

—
CALLED TO ORDER.

The Convention was called to order promptly at 10 o'clock by Vice-President L. W. Buck, in the absence of President Ellwood Cooper.

PRAYER.

Rev. L. J. Garver opened the Convention with prayer.

VICE-PRESIDENTS.

B. F. Walton, of Sutter County, and J. B. Fuller, of Yuba County, were chosen Vice-Presidents.

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ADDRESS OF WELCOME.

By JAMES O'BRIEN, of Smartsville.

MR. PRESIDENT, LADIES AND GENTLEMEN: The representatives of the horticulturists of Yuba and Sutter Counties, and the citizens of those counties, join in tendering you a hearty welcome to our section of the State.

To no assemblage of a representative industry of California can the people of this section extend a heartier welcome than to you, representing as you do the fast becoming leading industry of this State.

A few years ago, you are all aware, this section of our State was devoted entirely to the mining interests. As the products of our mines decreased attention was called to the production of cereals. In this we excelled. As the country became more populated the value of land increased, necessitating the production of commodities other than wheat and barley. Then was our attention called to that great art, horticulture.

Within the last few years, where were large grain fields, are now to be found orchards and vineyards, the nucleus of many happy homes.

In our valleys and in the foothills adjacent you will, before your visit draws to a close, have an opportunity to observe the progress that has been made within the past few years. Our deciduous fruit compares

favorably with any produced in the State, and has the additional advantage, owing to climatic influences, of being marketed as early, if not earlier, than in other less favored localities. Our citrus fruit industry is as yet in its infancy, but its success is assured, as has been fully proved at Colmena, Palermo, and Smartsville, the oranges grown at the latter place having been pronounced by the judges at our last citrus fair as the finest they had ever seen. During your short stay with us we know we will be benefited by the advice you will give and the experience you possess, and you will find us willing students of our art. We are anxious to learn all that we can from you. Time and experience have shown to the world that great good results from the interchange of opinions on any subject-matter that may be brought forward for general discussion, and in no branch of the world's work has general discussion been of so prolific benefit as in the art of horticulture.

Looking backward to the early work of horticulture in this State, we find that in no State in the Union has progress been so marked and satisfactory as in our State, and all owing to what? To the gathering together of the representatives of our art, and the thorough digestion of each principle and part of the many divisions of our work which are brought forward at these reunions.

You have at this particular time granted us the favor of one of these reunions, and rest assured we shall take advantage of it, both in deriving the benefit of your experience, and in noting the criticisms you will make of the methods employed by us in horticulture in Northern California.

During your stay we will ask you to view a few of the historical orchards of our section. Many of you being pioneers of the days of gold, will recollect our first horticulturist, John A. Sutter, whose old home, Hock Farm, lies on the bank of Feather River, in Sutter County, about five miles west of here. Also the orchard of that pioneer who spent his life and his fortune in the interest of horticulture, the grower of the first early fruit—John G. Briggs; and should your time allow you, visit our foothill section, where in years past the rocker and monitor held sway, but now are to be seen groves of deciduous and citrus fruits.

Your humble servant is, as you are probably by this time aware, not an orator nor a word painter, hence his inability to fully express to you the welcome with which we greet you. But in conclusion will say from our hearts, our homes are yours. You are welcome, and we know that as our acquaintance broadens, as the contact with one another increases, not only will we be benefited by the relation, in matters pertaining to our craft, but mentally, morally, and socially. Friends of horticulture, you are doubly welcome to Yuba and Sutter, the sister counties. [Applause.]

ADDRESS OF VICE-PRESIDENT L. W. BUCK.

FELLOW CITIZENS: We assemble here to-day under the auspices of the State Board of Horticulture. In the absence of our worthy President, Ellwood Cooper, who, on the eve of starting, was taken suddenly ill, the pleasant duty of presiding over this intelligent assemblage devolves upon me, by virtue of my position of Vice-President. I deeply regret his inability to be with us to-day, as I know how much he would have

enjoyed being present, and renew that friendship so happily begun at all previous sessions. We shall miss in him a veteran horticulturist and an able presiding officer.

I am not able to go into details of many things that our worthy President would be able to do were he here. Nor have we been able to have the annual report for this year, in which the proceedings of the last meeting should appear, ready to hand to you, as was done at our last meeting at Santa Cruz; not from any want of diligence on the part of our able Secretary, but through circumstances over which we have had no control. It is now in course of completion, and will soon be published. In it will be embodied the proceedings of our last Convention and those of this one now convened. During the year numerous bulletins have been issued of many investigations, and are here for distribution, and we hope every one will avail himself of a copy.

The State Board has provided for these yearly meetings in different sections throughout the State, to enable you and us, that are engaged in horticultural pursuits, to come together for a general interchange of ideas, and be profited by comparing views on the many questions regarding which we have a common interest.

This will be the fifteenth State Fruit Growers' Convention, and the eleventh held under the auspices of the State Board. I desire to call your attention to a matter that is of vital importance to the fruit industry of this State—both citrus and deciduous—and that is the wholesale importation of Eastern and foreign trees infested with insect pests and fungous diseases. There can be no doubt that a law should be enacted by the Legislature that would forever stop their wholesale distribution. The law does not now prevent any one from importing trees and plants, but does provide the necessary requirements after the trees are landed, when, if found infected, they may be disinfected, or action brought before the Courts to declare them a public nuisance, and the Court may or may not order them destroyed. The Constitution forbids the Legislature from giving judiciary power except to Courts, but a law could be enacted that would prohibit the entry of trees from States and countries where deadly diseases abound. A provision should also be made whereby the importers could be made to suffer the costs of action. A case tried in Los Angeles was a great expense, borne by that county and the State.

The wholesale adulteration of foods, and especially olive oil, is really appalling. An organization composed of foreigners has in contemplation the establishing of a depot at San Francisco, for the purpose of disposing of oil purporting to be pure and made of olives. It was to enlighten the people as to the unwholesome effect of these spurious articles that a Convention was called by this Board, for the purpose of having the growers unite to defeat, in a measure, the sale of such goods under false representation. The result has been that since their organization the people have been taught, in a measure at least, the injurious effect of adulterated oils upon the human system. Of the many samples of so-called olive oils that were given to the State Analyst to test as to purity, only a small percentage were found free from ingredients known to be injurious. This investigation will be continued, and, with the aid of the government chemist, it is expected that much good can be done, until the passage of such legislative enactments as will secure the results desired.

Complaints were also received showing that some fruit canneries have

canned California fruits without sugar, using only water. These goods, we understand, have been put up for dealers outside of the State, greatly to the injury of our fruit trade. Also, that Eastern fruit is being labeled and sold as a California production. Such practices should be condemned and steps taken to punish the offenders.

It is of the utmost importance to the producers of our country to know, from time to time, the condition and amount of the foreign products with which they compete. To this end we have asked the Department of State, at Washington, to instruct the consular officers throughout the country to report by telegraph the condition and amount of all crops with which those of this country compete. The department asked that the subject-matter be referred to the Secretary of Agriculture, and if he considered the matter of sufficient importance, for him to advise the State Department and offer such recommendations as he would deem proper to make. The Associated Press dispatches from Washington have announced that such recommendation was but recently made.

Insect pests are better understood than formerly, and effectual remedies have been invented; yet there is always room for improvement, and the discussions ought to give us more enlightenment. The future of the successful fruit growing in this State depends upon keeping out the baneful maladies that have proved a great menace to the industry in many parts of the world. You are asked to adopt measures whereby this may be accomplished. The Legislature wisely provided an appropriation of \$5,000, which enabled us to send Albert Koebele, the expert who discovered the *Vedalia cardinalis*, to Australia, New Zealand, and adjacent countries, to search for and import the parasitic and predaceous insects that may be found there, with the hope that some, at least, will prove equally beneficial. The Department of Agriculture promptly responded to our request, and lost no time in allowing Mr. Koebele to be sent on this important mission; therefore, we should not be unmindful, and express to "Uncle Jerry" an expression of our regard.

Nothing connected with the coming Columbian World's Fair presents itself of more importance to the producers of this State than the adoption of a scale for judging fruits. In the East various scales of such character are in use, but none of them are such as producers in this State could compete with. The reason for this is that the fruit of the East is grown under very different conditions and in different soil and climate. Scales for judging such fruits cannot apply to our fruits, as grown on this coast under entirely different conditions. Our fruits beat the world in all respects, but it cannot be expected that fine fruit could ever compete against fruit to be judged by a scale made applicable only to it. I recommend the appointment of a committee to formulate such scale, for judgment of all fruits, for your adoption.

I well remember, only a few years ago, when through the persistent efforts of the late Matthew Cooke, who may well be called the pioneer in bringing out remedies for the many fruit pests that we have been troubled with, the first law was passed by the Legislature to quarantine infected trees and fruit packages, and the strong opposition of fruit growers themselves to the enforcement of said law. But now the fruit growers of the whole State are anxious to know how to act, and through the experimental work of the State Board of Horticulture have been able to, in a large measure, save their deciduous fruits from the ravages of the Pernicious scale.

There was a committee appointed some time ago to take measures to raise money to erect a monument to the memory of Matthew Cooke, and I hope before this meeting closes that said committee will be able to report that they have succeeded fully, and that before many months elapse a monument will be erected which will show that the fruit growers of California are not ungrateful for the valuable services rendered by that friend of the fruit growers, Matthew Cooke, whose time and money were always at their command.

There are many subjects of importance that may well be brought up before this Convention of fruit growers and those interested in fruit growing, such as the best methods of growing, picking, packing, shipping, and marketing fruits, transportation, needed legislation, the Columbian World's Fair Exhibition, the issuing of an abridged report from 1885 down to 1891, and any matters that you may deem proper to take action upon.

POEM.

MISS ALICE PRATT, of Santa Rosa, read a most appropriate poem entitled "California," which elicited much applause.

OUR CHIEF EXECUTIVE.

At this stage of the exercises Governor Markham appeared, supported upon the arm of John H. Jewett, who introduced the Governor in the following language: "Mr. President, I have the honor of introducing to you the Governor of California."

THE PRESIDENT: I am happy to meet you; and on behalf of this Convention I heartily welcome you here. It affords me great pleasure, ladies and gentlemen, to introduce a gentleman in whom we all have a very deep interest, our Governor.

ADDRESS OF GOVERNOR H. H. MARKHAM.

LADIES AND GENTLEMEN: When I received the notice yesterday that I would be expected to reach here to-day, I hardly knew whether it would be possible for me to respond. In fact, I have every day in the week allotted to something that I have promised to do, but when I found it was possible for me to come and be able to return to attend to those matters, I concluded to be present. But I found myself, Mr. President, in a very awkward situation when I seated myself in the car this morning. I realized I was coming here to meet the most intelligent body of citizens in the State of California, and reflecting that I did not know what I was coming for, or what I would be expected to say when I reached here, I had a notion to return and find out. I finally concluded not to do that, because I apprehended on arriving here I might learn something in regard to the objects of this meeting.

I realize that you have come here to discuss one of the greatest industries of this State, and I hardly know what I can say to you that can be of interest, because I apprehend that there is not a man here

who does not understand the work that he is engaged in better than it would be possible for me to tell him. I can say, however, that when I left the East to come to California, I had always, up to that time, practiced law. I knew nothing of fruit growing; I hardly knew the different kinds of fruit, except as I purchased it in the market. I came to California with the idea that I wanted to be a fruit grower, so I bought a fruit ranch, and started out in earnest to raise it.

I believe it will not be out of place for me to give you a little of my experience, because before this Convention is over you will hear a great deal upon the question of theories, and some of the best theorists in fruit growing never raised a particle of fruit in their lives, and have never picked a pound of peaches in the world. I began with a young orchard of trees not as tall as myself [laughter], and when the first crop ripened—and I assure you I thought it never would ripen—I started out one morning about four o'clock to pick the peaches I thought were ripe to take to the cannery, and have them canned. I did not understand picking them very well, or how to test them, or know just what to do, but I felt of every peach to determine if it were in proper condition to pick. I worked very industriously until eight o'clock, and then had my breakfast, after which I started for the cannery. On my arrival they were weighed out, and I received for them just 37 cents. [Laughter.] Now, the peaches were not to blame, and the trees were not to blame, but I simply picked them a little too early, and it took me a great while to find a very few peaches that would do for canning purposes. After that I concluded to wait until the peaches were in better condition. I have followed that up, and I have never lost interest in it. I have worked personally in the cultivation of fruit, and if I wish to have anything done that is really scientific, my hired man renders me all the necessary assistance, because he knows more about it than I do. [Laughter.] In a short space of time I learned to pick peaches as well as he could, and received as good a price in the market as he did. The fact of attending to these things personally, and entering into the absolute labor necessary to produce fruit, has given me a great interest in the business, and I have gotten so now that I can talk of fruit first rate. Of course, I do not want the most experienced men who are in the business to talk to, because I do not think I would create a favorable impression; but the ordinary fruit man I can converse with in a very intelligent way, and he goes off feeling and believing that I know a great deal about fruit raising. [Laughter.]

The impressions that I received concerning the fruit ranches in this State can be related in a very few words. I have felt that if we could have our fruit ranches taken by industrious people, by people who, with their families, are willing to work and devote the same time and attention to them that the farmer and his family do in the States, there could be little question that money could be made more easily in California than it is made on the ordinary farm in the East.

I believe there is not a person here who will not bear me out in the assertion that there are very few farms in the East of one hundred and sixty acres, after the interest and necessary expenditures for keeping the farm in proper condition were paid, but would leave very little at the end of the year for the owner's work; but in the East, as we all know, the average wealth of the farmer who went into Wisconsin, Minnesota, and Iowa, for the first ten years, was about \$150. They went in there

and worked; every man worked from sunrise to sundown; every child in the family had something to do, and in that way, by the strictest economy, in a very short time they were able to have all the comforts of life; and to-day, in many of those States, they are very comfortable, and most of them independent.

In the neighborhood where I settled I found it filled up with men like myself, who had always been accustomed to doing something else; always merchandising or engaged in some profession, and who were not accustomed to doing labor that could be employed at \$1 or \$2 a day, and the consequence was that they hired everything done. If they had fruit enough to pay them for going to market they would go, and if they thought there was not quite enough they would simply stay at home, and let the fruit rot on the ground. Now, that is the history of those among whom I settled for the first few years. If it were possible for them to do East upon the farm as I have recited, everybody do something toward taking care of the fruit, it would, at the end of the year, be a benefit to the family who availed themselves of the opportunity.

I am pleased to note that wherever I have been throughout the State for the last two or three years, I find that the canning and drying of fruit, and in many instances picking, is being done by the ladies, and oftentimes by children; and they do it without a feeling that they are doing anything wrong, and without injuring their health in the least. They do that kind of work which requires a little skill and time, but not so very much hard labor.

I was proud of my two little girls when I returned from Washington two or three years ago, when my wife recited to me what they did. They applied to their mother for an opportunity to earn something for themselves, and she said: "If you want to earn something there are some peaches there; dry them, and whatever you gain for them you shall have for yourselves." I want to say to you that those two little girls, without the slightest assistance from anybody, prepared the peaches, apricots, and prunes, dried and put them into sacks, and I took them to town myself, sold them, and received \$96 for their labor that fall. [Applause.]

It occurred to me at once that even the children, if they saw fit, could help to earn something towards supporting the family and caring for themselves. I think every boy and girl should be taught to know what it is to earn a dollar by their own hands, let them be rich or poor. [Applause.] It is the unit upon which we have to base everything. Every time a man spends \$5 that is useless he ought to realize, if he works by the day, how long it will take him to earn it. Of course, I am talking to gentlemen here who are along in years. You have earned what you have, and all you have to do, if it is possible, is to teach your children, let them be boys or girls, what it is to know the value of money, and not allow them to grow up with the idea that their parents will leave their wealth for them to squander. There was a time when we considered it a very unfortunate thing to be born poor. At the present time, I regret to say that you can scarcely find one boy who has been born rich who continues to be a good man all his life, and if he does he is entitled to a great deal of credit, because he cannot appreciate money like the boy who earns it himself.

It is needless to say that fruit raising is one of the greatest industries of this State. You all know that, but it has impressed me deeply that a

large proportion of the fruits we produce cannot be produced anywhere else to that degree of perfection to which we are capable of producing it here; and that being the case the whole world will look to California for fruit. Of course, we have one serious problem to solve, and that is the marketing of our fruit; not to the wholesale dealers, not to the middle men particularly, but to the people themselves. Our fruit at public sale brings no more than it ought, but when it passes from the wholesale dealer, or the auction man to the retail man, then the first thing he does is to put up his sign that he has California fruit for sale, and charges three prices for it. That I have found to be my experience in the various cities I have visited. Just what we can do to overcome that I do not know, but I do know this, Mr. President, that when our fruit can be produced as cheaply, according to the quality, as our Eastern fruit, we shall never have any difficulty in disposing of it.

I can only say this much, that the course which this Board has taken, so far as I am aware, for the last few years, is in entire accord with my ideas of disseminating knowledge throughout the whole State. It is worth a great deal to any one who desires to go into fruit raising to hear from some practical fruit man or woman, the real course to be taken from the time the ground is prepared to receive the trees until the fruit is dried, shipped, and marketed; and certainly it is worth more to the uneducated fruit man to hear the intelligent discussions emanating from this Convention, than to gaze on the finest display of fruits in the world. You can look at fruit; it is attractive to the eye; it is beautiful; it is a good thing to have; but you would prefer to talk to some one who is thoroughly posted, and who will tell you what he thinks you ought to do and what he did, and what he thinks you can do, in order to accomplish the same results. This knowledge is something you can take with you, and will be of priceless value. This coming together to compare notes, discussing the methods, plans, and the varieties of fruit, what will be the best, what will sell the best in the market, are certainly important problems for the fruit grower to understand.

In my old State, the State of Wisconsin, they had a great many fairs, and exhibited everything usually connected with them. The people went to see the beautiful flowers, looked at the different kinds of stock, but they made no progress until a farmer by the name of Hiram Smith, who was a very practical man, conceived the idea that it would do the farmers of Wisconsin more good to come together and discuss what the profit might be from the things they saw at the fair than the actual exhibition of the things themselves; therefore, he organized an association of farmers, and since then the fairs have diminished into insignificance. This knowledge, I say, has been disseminated by the farmers getting together and comparing notes. Hiram Smith did not know it all; he only conceived the idea that if they could come together and talk matters over, he would learn something, and be able to teach others.

When we take into consideration the labor performed and the immense amount of literature sent out by this Board, it is no wonder we have made great progress. If I could spare the time I would give more to stay right here for the next two or three days, to listen to the discussions upon the papers that will be read, than almost anything I can think of. And I know I would learn something, whether any one else did or not.

I think that it is very important that every business man should endeavor to learn what you are doing for the interests of this great State.

I will conclude, ladies and gentlemen, by saying that I am very glad to have met you, and thank you for your very kind and earnest attention. [Applause.]

PRESIDENT BUCK: I will say, Governor, that on behalf of this Convention I tender you our thanks for the able remarks you have made, and I can only say that I wish you could be with us through the Convention. It is now half-past eleven, and I will declare a recess, in order to afford the members an opportunity of grasping our Governor by the hand.

Recess.

AFTERNOON SESSION.

W. H. ROBINSON, of Stockton: I move that the reference in the address of the President be referred to a special committee of three, to report to this Convention on the matters recommended therein for its action.

Adopted.

The Chair appointed R. B. Blowers, of Woodland, W. H. Aiken, of Wrights, and Frank A. Kimball, of National City.

FRUIT VS. GOLD.

By JOHN GOSS, of Santa Rosa.

The growth of California may be divided into three periods: First, the golden age, or age of gold; second, the cereal age, or age of wheat; and third, the horticultural age, or age of fruit and seeds.

Each period existed to some extent from the beginning till now, but we can safely assume that the golden age reached its highest point from 1850 to 1860; the age of wheat from 1860 to 1880, and the horticultural age from 1880 to the present time.

It is the purpose of the present paper to note some of the characteristics which attend the introduction of fruit culture, as distinguished from the prominent features of the gold or mining period.

First, as to value. It is difficult to obtain exact statistics of gold production, but from all the data that can be collected, it may be assumed that the annual production of gold in California has been about \$15,000,000 or \$18,000,000 per annum; the very latest reports place it at nearly \$14,000,000, and about \$1,000,000 in silver. Turning to the value of the fruit production for the past year, by culling a few items from the daily press, we find data on the fruit question as follows:

SAN JOSÉ SENDS OUT THE HEAVIEST SHIPMENTS IN ITS HISTORY.

SAN JOSÉ, October 12.—The shipments to the East from here last week were the heaviest in the history of the railroad. The total fruit and other products sent away amounted to 4,010,420 pounds. Of this 1,576,845 pounds were canned goods, 1,040,245 green fruit, and 1,177,105 dried fruit. The shipments of garden seeds were 38,280 pounds.

This, it will be seen, was but for one week.

The story of a giant industry less than ten years of age is briefly told in the following dispatch:

SECOND-CROP RAISINS—FRESNO COUNTY MAKES ANOTHER BIG SHIPMENT.

FRESNO, October 14.—A special train of twenty-six cars, all loaded with raisins, left this evening for New York, via New Orleans. This makes two hundred and fifty carloads of raisins that have been shipped East so far this season, or an equivalent of twelve solid trains. The weather for the past two weeks has been the very best possible for curing raisin grapes, thus making the second crop large and of better quality than that of last season.

Here is another:

RIVERSIDE, September 4.—The "Phoenix" will publish to-morrow an estimate of the raisin crop of San Bernardino County for this season, showing a total for the county of 400,000 boxes of twenty pounds each. The different localities are accredited as follows: Riverside, 150,000 boxes; Etiwanda, 100,000; Cucamonga, 50,000; Redlands, 50,000; Ontario, 25,000; Highlands, 25,000. The crop is the finest ever raised in this county.

And how is this?

NEW YORK, September 21.—The "Commercial Bulletin" says: The exports of raisins from Denia thus far have been only 50,000 boxes for America, whereas for the corresponding period last year 468,000 boxes were in transit. It is evident that the competition of California is feared, and importers hesitate to send forward any considerable orders upon the basis of the values cabled. Several carloads of three-crown California raisins in sacks sold here last week at 6 cents, delivered here.

These are only a few haphazard excerpts from the daily press, from the leading points of production. What the sum total of the value of our horticultural products would be in one year, it would take a very lengthy investigation to tell, but there is no doubt it would cast the yield of gold and silver combined into impenetrable gloom.

Before leaving the subject we might append a few more significant facts, thus:

WASHINGTON, September 24.—The fruit exhibit in connection with the meeting of the American Pomological Society, though never a leading feature of these meetings, is a very creditable display, showing on the whole careful and intelligent selection. The champion Navel oranges come from California, five to six inches in diameter; and that State also takes the palm for magnificent quinces.

A railroad official puts the matter thus:

It is generally an easy matter to gauge the prosperity of a State when its balance of trade is on the right side, or is even. In former years, the shipments from the East to California by rail were much larger than those from this State east-bound. We used to haul many empty cars to the East in order to secure west-bound tonnage. The volume of the east and west-bound shipments is about even, and the cars that come in loaded go back loaded. This is the direct result of the change of the character of the products of California. Cereals have been supplanted by the more valuable product of deciduous and citrus fruits and other crops, the movement of which has equalized that of the manufactured goods coming here by rail from the East.

Speaking of the great and justly esteemed friend (?) of the farmer, the railroad corporation of this State, it is well to note that the gold and silver output of the State, or of the entire coast, was not sufficient to support one transcontinental railroad, while since the successful development of horticulture we now have seven distinct lines, only one of which, however, centers in California, much to her misfortune.

It is estimated by a San Francisco paper that it will take five thousand cars to transport the orange crop alone, and this number, by the way, would make a train between fifteen and twenty miles long.

Leaving now the mere money value of our horticultural products, we will turn to some of the other effects.

First, as to the home-making process. Only a few years ago land was held in such large quantities by single individuals that it would

make a baron of the Middle Ages blush for shame, and this was in what we were wont to call "a poor man's country." Had the process not changed, it would have been the poorest country on earth for a poor man to come to. But the change has come. The owner of twenty, ten, nay, five acres is no longer despised, and it could be easily demonstrated that there are numbers of those who till five, ten, or twenty acres of land who live more comfortably on their small holdings than the slipshod farmer formerly did on his proverbial quarter section. The tendency, nay, the actual fact is, that large land owners have been compelled to subdivide their lands, and thus destroy what at one time was the greatest curse of the State.

There was but slight difference between the Spanish caballero, who fed his flocks on a hundred hills, running roughshod over his less wealthy neighbor, till gambling and whisky clapped a mortgage on his ranch, and the American pioneer who did the same thing.

In educational matters the result has been keenly felt. The increase in public schools from 1870 to 1880 was 1,500, from 1880 to 1890 was 1,764. The increase in teachers from 1870 to 1880 was 1,700, from 1880 to 1890 was 2,539. This is easily explained. The large farm usually supported one family, the children of which attended schools in large cities, and the little red school house was left to afford a safe hiding place for the yellow-hammer and the wood-pecker. But now there are ten families where formerly there was one, and twenty children where there formerly were but two or three, and the effect is seen in the school first of all.

In the next place, let us look at the effect of horticulture on town-building. Since the culture of fruit commenced, towns have sprung up like magic. These are not like the mushroom growths of the mines, but solid, permanent, and substantial. Such cities as San Diego, Los Angeles, Fresno, Chico, Pasadena, Riverside, and scores of others owe the rapidity and permanency of their development to horticulture.

With the towns has come the high school, the Sunday-school, and increased and ever increasing social and political advantages, and around these cities are growing up numerous and valuable suburban additions.

There is another respect, too, in which a wide change and difference are seen, and that is in nomenclature; that is, the naming of places, towns, and localities. In the "good old days" such names as Hangtown, Dogtown, You Bet, Shirt-tail Cañon, Roaring Camp, Poker Flat, and many others, were familiar, but they live now only in the imagination of the local satirist; but to-day we have Pomona, Riverside, Redlands, Ceres, Oceanside, Pasadena, Palo Alto, and others as euphonious and suggestive.

May we not safely assume, therefore, that the period of horticulture outranks the gold-hunting era in pecuniary importance, in home-making influence, in school-building power, in town-creating force, in social, moral, and political importance.

I have said nothing of the much larger army of employes that receive work, directly and indirectly, in the cultivation, picking, pruning, packing, drying, and handling of fruit, than that employed in mining. Tens of thousands of laborers receive employment in summer, who otherwise would be idle, and when we remember that women and chil-

dren are largely benefited by the former system, the value of the new direction to our industries becomes of paramount importance.

It might be added, to conclude, that we are at the beginning of fruit culture, and the end is not in sight. If the work goes on there is no telling what a state we may reach. Possible fifty years from now the man who owns ten acres of bearing fruit will be considered wealthy, and he who has a half acre will be well off.

THE CARE, GRADING, AND SELECTION OF FRUIT.

PRESIDENT BUCK: As there is no essay upon the subject, we will be glad to hear from any one who has anything to offer. I hope you will not waste time. I will call on Mr. Block, of Santa Clara, as he is a very good talker.

A. BLOCK: I am not prepared to deliver an essay upon a moment's notice, but will be glad to answer any questions that may be asked in relation to subjects I am familiar with. I think, though, these discussions ought to follow essays.

MR. BUCK: I think a more practical result will be obtained by oral discussions than by written essays. You forget what is in an essay, but when my friend Block gets up and talks you can understand what he says, and he talks right to the point.

R. B. BLOWERS: What is the best sized pear for shipping to the Eastern States from a market standpoint?

MR. BLOCK: I am sorry to say that I am not ready to answer that so as to make it satisfactory. Now, some varieties of fruit of the larger size are more desirable.

MR. BLOWERS: Well, confine your answer to the larger size.

MR. BLOCK: I have no doubt that the Bartletts would be the most desirable, although I am satisfied that the smaller sizes for shipment are the most profitable. Our Sacramento friends are picking Bartletts very little over half grown, and ship them in order to get them in early, and in that way they realize much better prices than we in our locality for the full grown and much better fruit. In fact, some dealers in the East would prefer to have the smaller size of the same variety, while others prefer the larger ones. In New York they want everything very large; then, again, in Chicago some customers would prefer the four to the five tier, while others would prefer the five tier and pay the same price, so in that respect we cannot tell. In fact, the locality has a great deal to do with it, and the time of shipping. Every locality has its advantages and disadvantages. What would be advantageous to Marysville or Sacramento would not be advantageous to our section of the country. You can raise fruit and sell it at a big profit, which, in our section of country, we cannot think of doing. Some late fruit is more advantageous than some of the earlier varieties, but in this section of country it would be almost folly to attempt to raise it. You can raise some in this section, but I don't think it would be as profitable as the early fruit, either in Yuba or Sutter Counties. If you could send the four tier, say in the month of June, I have no doubt you could realize more than you could for the five tier; but, of course, you want to send it there as early as possible.

MRS. L. U. McCANN: I would like to ask, Mr. Block, if you ship immediately upon picking, or do you let your fruit go through a process of ripening in your storehouse before you ship it off?

MR. BLOCK: What kind?

MRS. McCANN: Bartletts.

MR. BLOCK: I would advise you to ship on all occasions immediately after picking, because you are not apt to get them there too green, and the moment they begin to show the least speck of yellow, indicating ripeness, they do not want them; that is, they would take them at a much lower price. We have much to contend with in that respect. We must pick them in the right time so that they will arrive in the East in the right condition, then you can sell them for one half the price more than if they arrived in too ripe a condition. It is a strange fact, but nevertheless true, that whenever fruit goes East in the condition just ready for use, you are apt to get nothing for it, unless it should be very scarce, otherwise you may be thankful if you make railroad freights out of it. I make it a rule to send my fruit away as quickly as possible. Sometimes you hold the Bartlett pears back two or three days and then ship them, and blame the commission men you send them to, when, in fact, the fault was with yourselves. I repeat that you send your Bartlett pears away as early as possible, and then you will be more liable to get a better price for them, because the early ones are more generally in demand, while the longer you wait the less you will be liable to get for them.

C. H. ALLEN: Does the pear ripen more rapidly on the tree, or in the bright sun, or gathered up, or put in a very cool shady place in piles and covered? I pick my Bartletts, pile them away, and cover them, and ship them much later. I am two thousand feet high, and I get a very good price. I did that by keeping them in a shady place. I thought, and still think, they will keep better picked and put away in a shady place than by hanging in the bright sunlight on the trees. I may be mistaken. Would they have kept better and lasted longer on the trees than picked and covered?

MR. BLOCK: I think not. I would pursue a different course by putting them into refrigerator cars. I would rather do that than take chances keeping them here. You have a higher elevation and, consequently, can keep them better than we can. Now, in connection with that, I may say this: the Beurré Hardy, which is a very profitable pear, and I think it is better than the Bartlett, I can keep for three or four weeks before ripening; but you take the same pear and send it East in an open car, and when it arrives there I do not think you will get two bits a box for them. The change of temperature has a decided effect on them. Leaving here in a temperature of 80 degrees, and then going right into a country of 90 or 95 degrees, rots them right away. It seems to be the peculiarity of that pear.

QUESTION: What is the true sign the early peaches take when they are ready to ship?

MR. BUCK: All signs often fail. There has been quite a revolution in the shipment of fruit from California within the last few years.

Q. Is there a difference whether you ship in a refrigerator or in a ventilated car?

MR. BUCK: If you ship in a refrigerator car your fruit should be much riper than in a ventilated car. For a refrigerator car, I think, the peach

should lose the fuzz, and get the clear, transparent skin just before it commences to soften. The peach should not be at all soft on any part, even on the ridge; the nearer you get it to that the better, even for a ventilated car; but if for a refrigerator car you can even let them go beyond that, it is still better. I will say further, that oftentimes the same thing is not true of one car that is of another. If a ventilated car, especially, strikes over into the Missouri River Valley in hot, sultry, rainy weather, it is almost absolutely certain to arrive in any market in a poor condition; if, on the other hand, you have bright, clear weather, the same fruit will carry through in good condition.

MR. BLOWERS: Some people think that the electrical disturbances do not injure our fruit.

MR. BUCK: Of course, I cannot tell that; we only get our information by telegraph of a storm, whether rainy or sultry, and, of course, we do not get any definite information as to electric storms, except what we glean from newspapers, consequently it would be very hard to give you any information in that respect.

MRS. McCANN: I would like to ask Mr. Block to give us a list of the best late pears of the coast region.

MR. BLOCK: Well, at the present time, the Winter Nelis. In some sections they are the best to raise, if they are not smutty. Some places they are raised too smutty, and to the people living in those sections I would advise not to grow them. Nurserymen start out with four or five varieties for every one to grow. Now, you want different varieties, so that they will come in at different times, and then everybody will not be picking and shipping at the same time. If everybody sends them on at the same time, why, the railroad gets the profit. You have to study pretty hard. This is a kind of gambling business. The idea of every one planting the same thing is wrong. I have for the last two years attempted to introduce new varieties, and I went to a very great expense in importing the Beurré Clairgeau, and after awhile I may be able to get three or four new varieties.

MRS. McCANN: I would like to ask if you had any experience with the Winter Seckel, or Louis Bon de Jersey, a pear that ripens after the Bartletts. It is a good keeper, very luscious to eat, but too large; it is very handsome. How do they compare, or have you tried them, and also the Kiefer Hybrid?

MR. BLOCK: Kiefer Hybrid comes in a little ahead of the Bartlett. It is a good pear; I will not attack its character at all, but I will simply discuss it as far as the profit is concerned. It will ripen a little before the Bartlett. If you send it East and it comes in contact with the Bartlett side by side, you will not get as much for it as you will for the Bartlett. The Louis Bon de Jersey, of which I had a great many some few years ago, I think is a very good pear and very prolific. It is one of the best bearers we have, and you can make them large by thinning them sufficiently; they are rather small, because they grow in such large clusters. I have grafted all of mine over, for the reason that I had to ship them by slow freight on the railroad, which took from seventeen to twenty-one days, and of course they would not stand the journey. I indorse what Mrs. McCann said in reference to its quality. But things have changed, and last year I set out two hundred trees, as I want to make another effort on that old favorite. I am going to try it, but I am not prepared to advise under the present condition. Now,

if I want fruit to supply to my customers right along I can depend on the Louis Bon de Jersey. There is another advantage of the Louis Bon de Jersey, it will keep on the tree a long time, but how late it will keep I do not know. Regarding the Winter Seckel, I think that it is one of the finest pears that grows. In some sections it grows to a blackness, spotty and scrubby. It either bears too much or not enough. If they bear heavily you have to thin them out considerably. I have a good location for Winter Seckel, I am satisfied, and at the same time people living north of me I would not advise to plant, but probably south I would, on account of the mild climate.

MRS. McCANN: My experiment upon my pear trees was a perfect success. They were eaten in on one side by the blight. I applied lime, sulphur, and salt, and my fruit took the premium at the Agricultural Fair, as being the largest Seckels and the largest Winter Nelis that had been grown in Santa Cruz, and perfectly free from blight. I should like to ask what experience you have had with the Kiefer, Logan, and d'Anjou. The d'Anjou is a pear just ripening on my place; it is of medium size—about the size of the large Winter Nelis—a clear, green pear.

MR. BLOCK: I will say that locality has something to do again; you have a great advantage in raising the d'Anjou, if you can keep them on the trees at the present time. I had to pick mine in September because they were falling off, or else lose them. If you can raise them so you can keep them until the first of November, I say plant them as a winter pear. I had to pick mine two months ago, and if I had them now I suppose I would get a pretty fair price. I certainly recommend you to plant the d'Anjou under the circumstances. The Kiefer I do not keep at all; it has a very poor, insipid taste under the best conditions; it has a taste like a quince, and is not a heavy bearer either. I do not think they are good at all, and I will not plant any more of them, because they come in too early; they crowd me and they fall off.

MR. ALLEN: Do you think there is a difference between our Kiefer and the Eastern?

MR. BLOCK: The Eastern pears are a great deal better than ours.

MR. ALLEN: Why I asked, they insisted in the East that the Kiefer was the best pear they raised. I have never seen one yet anywhere fit to eat, and I agree with you entirely, it is more of a quince than a pear.

GATHERING FRUITS.

MR. BUCK: The next thing on the programme to be taken up for discussion is the subject, "The proper time to gather the different kinds of fruits; the thinning process, etc.," and perhaps it might be well to take in "The best varieties of different kinds of fruits to meet the wants of consumers in different seasons."

C. F. WYER: May I ask one question, and that is in reference to the time when you should pick Royal apricots? Now, there must be some condition in which they must be before picking them.

MR. BUCK: The age of the tree has a good deal to do with that. Royal apricots grown on old trees you can pick to a nice yellow, and they will carry safely.

MR. WYER: What do you say to a tree about six or eight years old?

MR. BUCK: The apricot will never color on the inside until it begins to ripen on the outside. If apricots are picked from old trees, my experience is that they will carry safely; they want to be nicely colored.

F. A. KIMBALL: When do you pick the Winter Nelis pear?

MR. BUCK: They generally ripen early, and I have picked them from the middle of September until as late as the sixth of November. I like to keep them as long as I can. There is no positive rule to go by. A good time to pick is when the foliage is just beginning to turn yellow.

J. L. MOSHER: Do not pears keep better where they are not irrigated? I would like to ask Mr. Block if he has ever experimented with fertilizers, and would they have any effect on the pear as to its keeping qualities—for instance, iron, sulphur, and phosphates?

MR. BLOCK: To the first point I wish to dissent from, that irrigated fruit will not keep as well as non-irrigated. My experience has been to the contrary. The irrigation of trees is beneficial, but it must be carefully attended to; you cannot allow your ground to become dry and then go and irrigate it, nor can you irrigate your ground and let it lie. If you irrigate you can leave your fruit longer on the trees than without irrigation. Now, in regard to fertilizers, ascertain what your land needs. As to picking early, you will find that if you irrigate, watch your foliage, and leave your fruit until it begins to change, you may have plenty of phosphates in your ground without any additional fertilizing.

R. P. McGLINCY: I would like to ask Mr. Block, in speaking of irrigation, if you make any distinction between what you call winter irrigation and summer irrigation; when winter irrigation leaves off and summer irrigation begins?

MR. BLOCK: Last year we did not need to irrigate at all in the winter, and I believe in winter irrigation particularly. I believe if people would take the water when it is running out of the creek that that would be a good time. I have depended on summer irrigation and put water on when I wanted it. I have taken it off of my Bartletts this year. I find that it swells out the buds, but I will probably have a good crop next year. I irrigate when I have taken the fruit off, and the early fruit I irrigate.

MRS. McCANN: Does it not deprive the trees of their necessary period of rest and recuperation for the next year, to urge them at once into the swelling of buds by irrigation, which rest they get in colder climates?

MR. BLOCK: Well, I have found no injury from it up to the present time, and I do not think it does, because I find, after all, my trees will let up for about two or three months, until, say, the first of March, and rest; and that seems to be all the rest they need. I have gone to considerable expense, and have got land that has cost me a good deal of money, and I want to get all I can out of it; and when I am gone it may require additional assistance, so I will let others after me work as hard as I did to make it up.

MRS. McCANN: I notice some of the largest fruit growers in Missouri advocate giving the pear orchards absolute rest after the trees are six years old. They say it is money in your pocket.

CO-OPERATION AMONG FRUIT GROWERS.

MR. McGLINCY: I am a new hand in the fruit business, and I do not know exactly where to start or how to start in order to make the best of it. We have been discussing in our little horticultural society for some time past the advisability of a "Dried Fruit Exchange." In Sonoma County they have also been discussing this project, and recently General Chipman has suggested the advisability of establishing a commission house in England for the sale of California dried fruit. If we could form a State organization in California, with branches in various counties in which the fruit industry will warrant it, we might have a Dried Fruit Exchange, and might thereby induce Eastern dealers to make their purchases therefrom. Whether such a feature as that is feasible or not, I am not prepared to say at this time. I have no fault to find with the commission merchants in this or any other State. The commission merchants of California have done the fruit interest a great deal of good in years past; but has not the time come when the fruit growers—I mean men owning an orchard and toiling from fourteen to sixteen hours a day in cultivating, and gathering, and taking care of the fruit—should take the matter in their own hands and market their own fruit? If it is, then it is time that this Convention should adopt some plan whereby those of us possessing a small number of acres might be able to get more for our labor in the future than we have been getting in the past. Those of us engaged in drying our own product will be glad, indeed, to have an organization of that kind, whereby we could meet the Eastern dealers as they come through this State gathering up the crop for the Eastern market, and show them what we have.

MR. BUCK: I am hardly prepared to go to that extent, for the reason that I think it is impracticable. I have made two or three attempts in this State to organize Dried Fruit Exchanges, and I believe they have not been a success. In regard to coöperation, I think that is correct; and it is more correct in regard to the handling of the green fruit crop than the dried crop. The dried fruit can be held, but the green fruit cannot; you can keep your dried fruit till the buyers come, or you can send it to some place to be sold; but the green fruit must be marketed the day you pick it, or you will lose it. There have been quite a number of instances of coöperation in this State for the purpose of disposing of the green fruit product, and they have been, in every case that I know of, very beneficial. It educates people to prepare their fruit in the proper manner, and becomes very instructive. If one gets a higher price than another, they certainly try to find out why it was so. There is only one trouble with a generous and hearty coöperation, and that is the unnatural jealousy that always exists among farmers and horticulturists. I have been manager of the California Fruit Union for six years, and consequently I have had considerable experience with coöperation. There have been a great many small sections that have clubbed together in some shape and loaded cars, and have been shipping them forward, through some State organization, to some central point, and while the result has not always been good, I believe they get fairly good money. This season has been a year of low prices, and those who have shipped East have fared no worse than those who have sold on the Pacific Coast. Without doubt the fruit crop, green or dried, if it could be held and sold under some one head, would bring more money. I am not thor-

oughly conversant with the work of the Dried Fruit Association, which was started some two or three years ago, but my general opinion is that it did very little business at a considerable expense, and that the results were anything but satisfactory. They now have, I believe, in Santa Clara an organization of that kind, and perhaps some one from there can tell us more than I can. I know that the larger portion of the dried fruit crop in this State has not been handled by any Dried Fruit Association, and unless they can have more of them, certainly they cannot be of any practical benefit. But when it comes to coöperation, I certainly favor that in every instance, and the larger the coöperation the greater benefit it will be.

MR. ALLEN: I was Secretary of an organization where some two or three hundred growers agreed to form a California Dried Fruit Association that was to handle and dispose of the fruit. They paid their assessment of \$1 per acre, and formed the organization, paid reasonable salaries to officers, and went through one year of its existence. That one year absorbed all the stock that had been paid in, and a little more, so that there had to be an assessment levied to help to pay up the salaries, but I think I was one of the four out of the two or three hundred who sold through the association, and the rest sneaked around to try to get ahead of the Dried Fruit Association to see if they could not do a little better, and the result was a most lamentable failure. I entirely agree with what Mr. Buck said, that it is entirely impracticable until men will come out like men, and stand right up to their promises. I believe it can be done. If we had in our Santa Clara Valley this year a good, strong Dried Fruit Exchange, it would have saved a few millions of dollars in money, and the lack of this organization has compelled every drier—and hundreds of farmers have dried this year who never dried before—to market his own fruit. Now, the farmer who has very little capital must sell his fruit immediately, for he has men to pay, and other necessary expenses to meet, and the result is the fruit has been sold for about one half what it is worth, as a matter of necessity. If there had been a strong Fruit Exchange, you could have had that fruit graded and sacked, and could have issued warehouse receipts for it at an advance of 2 cents per pound; there would be no risk whatever, and the pressure that the poor farmer experiences would be relieved. I think the time has come when we must have a Fruit Exchange, but how it is to be brought about is another question. It will have to be done, or we will be completely buried. Men who are buying and have laid out large orchards must have ready money to pay their current expenses, and unless there is some relief they will be compelled to sell their fruit at a great sacrifice. I think you could have one here, and in Sonoma and Napa. We can demand a reasonable price when we are organized.

MR. BUCK: There is also a difference between the dried fruit rate and green fruit, between carloads and fractions of carloads. These local organizations, I think, have been more than successful wherever they are working, and I think they should work in connection with some State organization, say at Sacramento, for instance; and I have no doubt but it would prove beneficial. But dried fruit is different from green fruit, and there are but few men who make the same variety who put it up alike, and there is a great variety of it; consequently it has got to be handled in small quantities, and mixed and blended as they do wine.

MR. MOSHER: I was one of the members of this Dried Fruit Association,

tion, and one of the greatest drawbacks was the grading of the fruit. Of course, every one who dries fruit thinks his fruit is the best. Now, if we were to send this fruit to be graded there must be judges to decide. First, it was thought best to sell fruit by samples, but they found that to be impossible. The fruit was put up by the various parties differently; some, for instance, would dip their prunes differently from others, and that would necessitate the appointment of inspectors to decide whether it was first, second, or third grade, and we had a very hard time of it. We discussed that matter, and also the kind of packages we put it up in, and we seemed to lose interest in it then and there. None of us seemed to agree as to how we should handle the fruit, and I think it died right there, while we were discussing that part of the business. I wish there was some more staple way of handling our dried fruit. At the present time it is almost like a gambling arrangement.

MR. MCGILINCY: Professor Allen said a great many growers dried their own fruit. I do not know but what three fourths dry their own. In my own neighborhood they were obliged to sell; they must have the money, and they did sell their prunes early in the season at a lower price. Those of us who could possibly keep our heads above water until the present time have made over \$10 to \$20 more on prunes than our neighbors who were obliged to sell or go under. It is to help those people that we should encourage this Dried Fruit Exchange, whereby they may be able to better their condition. I believe there is enough of the milk of human kindness in some of us, at least, to try and help our neighbors who are trying to help themselves, and while we are helping them we are really helping ourselves. By this system we can educate the newcomers and some of the old timers too, who do not know it yet, so that they can have a uniform grade of fruit, and when we say this fruit has been graded and offered for sale by the San José or Marysville Dried Fruit Exchange, dealers will in a very short time know the brands of the fruit and will be very willing to trade with the association. The dealers soon learn that the fruit is what it is represented to be.

MR. MOSHER: I had a large amount of peaches I asked 20 cents a pound for, and which I considered very nice. I considered them worth that, so as to be able to make a fair profit. I was offered 15 cents, but I held out for a higher price. I sold that fruit for about 10 or 12 cents a pound this spring. I held the fruit four or five or six months.

MR. SAUNDERS: As you were speaking of coöperation in handling dried fruit, I think, perhaps, it will be of interest to the Convention to know of a little movement begun in Santa Clara County in a small way. I think a multitude of small organizations is better than to have one that would cover the whole State. There were a few of us in a little obscure district who wanted to know more about the business we were engaged in. We organized a club, called it the Horticultural Society, and held our meetings in the school house, and we would talk of subjects that concerned our industry, and taking into consideration that the California Dried Fruit Association had made a failure, we concluded that that was the wrong way to begin; that in making a pyramid it was best not to try to stand it on the apex, but to begin at its foundation. Along last winter some time, there was an organization in San José calling itself The Buyers and Driers' Association, and looking forward to the

coming fruit season they naturally wanted to buy a little fruit by contract, so they formulated a contract and distributed it around the county among the different producers. Our little society took it into consideration, and began to pick it to pieces, and we thought there were some conditions that were rather hard. We did not want to go on until the fruit crop was ripe and ready to be gathered, and then take chances to be able to sell it to those who were buying for canneries, as they might reject a great portion of it, according to that contract, if it was a little overripe. We were not going to be caught in any trap of that kind. We got together and provided a method by which we were able to dispose of our fruit without depending upon such buyers. We called a public meeting; the animus of it seemed to be the indignation felt against these contracts, and we considered it an outrage upon the producer. At this public meeting we formulated a plan of what should be done. We explained the situation to the committee, and that committee had not been out more than an hour when they returned with the proposition to organize a cooperative corporation, with \$100,000 capital, shares to be sold at \$25 each. The object of it was to have a packing house, where we could do the grading. The quality of the fruit was good, and prunes ran very uniform in size and quality. At another meeting we appointed our committees and formulated our articles of incorporation under the laws of the State, appointed a building and various other committees, let out a contract to put up a packing house; but it turned out that a great many would not take stock. We built a drier and packing house about three or four miles from Santa Clara, and those who were not already preparing it home were able to haul their fruit there and have it disposed of by the company. We selected certain agents to take charge of the selling of the fruit, and I supposed it would have amounted to something in the near future. But I think it would be better to do away with the agents than to let it go through so many hands, but the agents seem to be getting a good return this year. Now, that is a sample of what might be done in a great many of the neighborhoods. If, after a number of these associations start and get into working order, they can combine through some produce exchange, and sell through some of these channels, it would be greatly to the fruit growers' advantage. There has been some dissatisfaction. When some of them hauled their prunes there they rattled pretty badly, and some of them were a little under-done.

MR. BUCK: I would like to ask you how much stock you sold?

MR. SAUNDERS: Six or seven thousand dollars' worth.

MR. BUCK: Is that all the capital you had?

MR. SAUNDERS: Yes, that was all we had. The plan was that our agents would pay for the fruit F. O. B.

QUESTION: Have they handled other fruits besides prunes?

MR. SAUNDERS: Prunes, apricots, and peaches.

MR. STABLER: I recollect in a meeting of the Dried Fruit Union I used this language: "That the State ought to have an agency and warehouse, clerks and foremen, and that this warehouse should be conveniently located, and have a large number of receptacles, such as bins, and when a lot of fruit came in, even the smallest lots, never mind the quality, just give the person bringing it in a general credit. Then after the grade was made, give a specific credit as against the general credit of a different kind of grade." But there were men who were

paid salaries, and that necessitated the assessing of members, and whatever the association had on hand the salaries and office expenses and rent eat it up.

RECESS.

MR. ALLEN: I move that this Convention adjourn, to meet at 9 o'clock A. M. to-morrow.

Motion carried.

TRANSACTIONS OF THE SECOND DAY.

WEDNESDAY, November 18, 1891.

MR. BUCK: The Secretary will read a communication from President Cooper:

SANTA BARBARA, CAL., November 13, 1891.

B. M. LELONG, Esq., Secretary State Board of Horticulture:

DEAR SIR: Please state to the Fruit Growers' Convention that it will be impossible for me to be present. I have, on account of the late ripening of fruits, been pushing the gathering, mainly that I could attend the Convention. This overwork and anxiety, in addition to the literary work in other directions, and mental excitement, has overtaken my powers, and left me in a nervous condition that needs quiet and extreme care. Since I have been honored with the presidency of the Board I have not lost a meeting and have presided at every Convention. It has been the great pleasure of my life, and now that I cannot be present is extremely hard to bear.

Present my regrets, and believe me very truly,

ELLWOOD COOPER.

MR. BUCK: I would state still further that I have received a letter of the same character.

MR. BLOWERS: I move, Mr. President, that the letter of Ellwood Cooper be answered by the Secretary, expressing the regrets of this Convention that he was not here to assume his proper place.

Carried.

HORTICULTURE IN DEL NORTE COUNTY.

By JOHN H. FOWLER, of Santa Rosa.

Del Norte County is situated in the northwest corner of the State, its northern boundary being the southern line of Oregon. The Pacific Ocean forms the western boundary of the county. No railroad penetrates the county from the outside world. If one wishes to reach it by land, he can travel by rail to Grant's Pass, Oregon, thence by stage to Del Norte; or he can take the ocean route by steamer to Crescent City. Its chief industries are lumbering and dairying. It contains about one million acres of land, more than one half of which is unsurveyed government domain, and a very large portion of the whole county is timber and mountainous land. The portion suitable for cultivation is very limited, and is found mainly in Smith River Valley and the country adjacent to Crescent City, and this area is principally devoted to dairying. About two hundred thousand acres of the county belong to the timber belt. The timber consists mainly of redwood, spruce, and fir. Del Norte is the chief source of supply of spruce lumber for San Francisco.

Horticulture, as usually understood, has been kept in the background and overshadowed by the other leading industries, and its development delayed largely by the comparative want of accessibility. Dwellers in

this section, however, are confident that they have both the soil and climate that will ultimately show excellent results in this department of agriculture.

The soil of the open arable land is a rich, dark, sandy loam, easily cultivated and retentive of moisture, while that underlying the forests is principally of a clayish character.

It is generally believed that soil that will grow giant redwoods and firs from ten to fifteen feet in diameter and three hundred or more feet in height, is capable of doing something grand in the line of fruits that shall excel in size, flavor, and quantity. Experiments that have been tried seem to verify this prediction; and as the saw-mills consume the forests they will be followed in due time by the fruit grower, and the land which from time immemorial has lain in the deep shadow and chill of the mighty forests, will be warmed into fruitfulness by the power of summer suns, and bring forth bounteous harvests.

The moist climate (the annual average rainfall being considerably in excess of that of San Francisco) and sandy loam especially favor the production of berries of all kinds, and it is predicted that great success in this line of fruit growing will be attained when better facilities for transportation are obtained, and the industry shall have been encouraged by the establishment of canneries.

Thimble-berries, two varieties of salmon-berries, two kinds of huckleberries, strawberries, and blackberries are indigenous to the soil. Where raspberries, strawberries, and blackberries are cultivated they yield immense crops, and with much less care than in most other places. I am told that a small space set to Red Antwerp raspberries was taken possession of by the canes, and afforded abundant crops year after year without cultivation, only requiring the removal of the old canes. Currants find there the conditions of soil and climate just suited to their culture.

It is claimed for the apples of Smith River Valley that they are superior to most of the California-grown fruit, and resemble those grown in Oregon. Pears also do well.

Plums do especially well there, and will eventually afford the horticulturist a profitable field for investment. The trees grow with remarkable thrift, and yield in great abundance large, fine fruit.

Peaches do not seem to thrive along the coast, but on the Klamath River, where the Indians have raised trees from the pits and suffered them to grow under the most careless culture, it is said that excellent fruit has been obtained. There is, doubtless, a large area of the interior of the country where peaches will flourish.

Judge Murphy has planted olives on his ranch a few miles from the coast, and reports a thrifty growth. Grapes are grown successfully at Gasquet's, on the upper waters of Smith River.

REPORTS OF COMMITTEES.

PRESIDENT BUCK: We would like to hear the report of any committee that may be ready.

COMMITTEE ON COOKE MONUMENT.

MR. JOHNSTON: Some time ago I was appointed on a committee by your Convention to devise some means by which a suitable monument could be erected to the late Matthew Cooke, who is, perhaps, entitled to more credit than any other man in California for discovering what we call the "fruit pests," their habits and their origin, and, perhaps, some of the best ways of exterminating them, and it seems to have gone almost by default. At what I supposed was the proper time—during the summer—as I was Chairman of the committee, I addressed a note to each member of the committee, requesting him to take steps for a certain length of time, naming it in the note, and reply to me what his success was, with a view to calling a meeting of the committee at some central point, where we might take action. Now, the Convention either made a mistake in appointing that committee or its Chairman, or something is wrong, and of all the notes I sent out I received a single answer, from brother Kells, who lives near me; not a word or dot from any other member of the committee. During the session last year of this Convention at Santa Cruz there was a little subscription paper circulated and some little money subscribed, but it was not put in legal form, so you cannot now collect that money. The time has passed by when that could be collected as a formal promise, because the obligation was not written in due form. I guess I will have to saddle a little off on somebody else. I think there is something wrong about this committee, something wrong about the manner in which they proceed in their business, because if there was anything that this committee ought to do, or any organization ought to do, or any body of men or women ought to do, is to remember their efforts. If Matthew Cooke has not proved a fruit grower, who has? I do not think it becomes me to say much upon this subject at this time, but simply, this morning, I desire to resign, positively, from this committee. I will not act in the capacity that I have been doing with the assistance that I have had on this important subject; and in resigning, I ask this Convention to appoint a new committee, and take this matter with vigor and work it to a success, and I will be one who will subscribe with my means and will assist that committee to do what ought to have been done a year ago. This matter should not be neglected, and you will find me assisting that committee, but positively not as a member of it.

MR. LELONG: Mr. President, I think Mr. Johnston has worked so long and faithfully on this committee, and has received so little support, that he is feeling somewhat despondent. I do not think he ought to give up, because he has worked so hard in this matter, and I know he understands it better than anybody else here. Mr. Johnston has been a very close friend of the late Matthew Cooke. At the Convention held at Santa Cruz a year ago a committee was appointed to collect money to purchase a monument, location, etc. From that time on the committee has been at work, but it has not met with the success it should; the fruit growers have not responded as liberally as they ought to. At the Santa Cruz Convention Mr. Johnston presented a report of progress, and also stated the difficulty he had in obtaining funds necessary. I then suggested that as good a way as any would be simply to pass a paper around and have the fruit men place their names upon it and the amounts opposite their names that they would be willing to subscribe

I do not think, though, that the money cannot be collected, because I do not believe that any person who put his name to that paper would refuse to pay it, if called on to do so.

MR. JOHNSTON: I move that the committee be discharged and a new committee be appointed. Carried.

MR. BUCK: Now, if there is any disposition of the fruit growers of this State to do anything toward the building of a monument to be erected over the remains of Matthew Cooke, now is the time, or let us say that we do not wish to do it. I will certainly appoint Mr. Johnston, because I do not know of any person who can or will do better than he can, and I am at a loss whom to name for the balance of that committee. It is certainly something that the fruit growers of this State owe to Matthew Cooke.

COMMITTEE.

The President then named Mr. Johnston, of Courtland, Mr. McKinley, of Los Angeles, and Mr. Kells, of Yuba City.

INSECT PESTS AND REMEDIES.

HYDROCYANIC ACID GAS TREATMENT.

By N. H. CLAFLIN, of Riverside.

As the treatment of fruit trees infested with injurious insects by exposing them to the fumes of hydrocyanic acid gas is receiving considerable attention in the southern part of the State, I have prepared a short statement of our methods of treatment, hoping to interest you in them, with the expectation that you will be able to use the gas, on deciduous trees as well as citrus, *with better results* than spraying, and with but little more expense, because one gasing will kill more scale than two sprayings, and with less injury to the trees. First, let us consider the application of the gas. A tent large enough to cover the tree is required. This is usually made of eight or nine-ounce denim, or eight to twelve-ounce duck, and is sized with glue sizing, or some preparation to close the spaces in the cloth and keep the gas in. Beeswax, starch, yellow ochre, and lampblack, mixed with a small proportion of oil, have been used; so, also, has rubber paint. It is now considered preferable to paint on the *inside*, and leave the outside light color. It is thought that the tents will be used somewhat by daylight, instead of after dark, as has been heretofore done, and that in such case the light color outside will give less heat within the tent. It is questioned by some, who have had considerable experience in the actual work of fumigation, whether it is the "actinic" rays of light which cause the injury to the tree, or if it be not because of the heat within the tent.

The size of tents vary from eight to thirty-six feet high, and from six to twenty-eight feet in diameter. Tents sixteen feet high, or less, can be put over the trees by hand, by using a half inch gas pipe around the bottom to distend it, and raising the bottom of the tent, by tipping this

hoop at an angle of 45 degrees, then raising it over the tree. Larger tents need a derrick or tripod to raise them with. Various devices are used for this purpose. Each orchardist can easily arrange for this, using as a guide the published descriptions and plates representing derricks.

The gas is generated by putting water, sulphuric acid, and cyanide of potassium together in a glazed earthenware vessel, which should hold from one gallon for small trees, where four ounces or less of cyanide is used, to four gallons for large trees, requiring one half to three quarters of a pound of cyanide. The quantity of water required is placed first in the generator, and it is then put under the tree eighteen inches or two feet from the body and the tent lowered over it. When everything is in readiness, the acid having been measured into a glass or earthen pitcher and the cyanide weighed into a tin cup, one man raises one side of the tent and another pours the cyanide first into the generator, then the acid, and immediately backs out from under the tent. Some use a wet barley sack over the generator to prevent the spattering of the chemicals onto the tent; it is also supposed to favorably modify their action on the tree, and render it less liable to be burned by the gas. The proportions of the chemicals generally used are: One ounce of acid by measurement to each ounce of cyanide by weight, in two ounces of water, or one part each of acid and cyanide and two parts of water. Some of our foremen use more water and less acid; as, for every five ounces of cyanide, four ounces of acid and fifteen ounces of water. Mr. Henry Leck, of Tustin, made a very successful test of day work by using dark-colored tents, and four times as much water as cyanide, and four ounces of acid to five ounces of cyanide. When gasing was first tried tents were left over the trees about fifteen minutes; now it is considered necessary to leave them from thirty minutes on a small tree, to fifty minutes on a tree twenty feet high, or larger than that. Dr. Dunn, of Pomona, is using about thirty tents of different sizes, and treating successfully all kinds of scale on deciduous trees as well as citrus.

In San Bernardino County some tests have been made on pear trees for pernicious scale, killing all the scale the first fumigation. The black, or olive, scale has been entirely killed on deciduous trees by once fumigating. The most of the work done has been on orange and lemon trees. Once fumigating will kill all the scale of every kind, and do no injury to the fruit or tree. The work in Riverside is done in this way: Inspection is by the county; every tree in an orchard is examined about once in six months. The Inspectors are able to find the scale, even when there are less than a dozen on a tree, whether a large or small tree. Whenever any tree is found infested it is marked with a crayon, or lumber pencil, the owner is notified of the find, and directed to have it cleaned within a specified time. A plat of the orchard is also made by the Inspector, locating the infested tree or trees, and sent to the Horticultural Commissioner in charge. The city owns six large tents and some small ones, and employs a Superintendent of Fumigation to care for them and manage the work done by them. He is also notified by the Commissioner whenever fumigation is required. He is furnished with a duplicate of the plat of the orchard, showing the number and location of the trees infested. Usually the owner employs the city apparatus, and the accompanying blanks are used: No. 1, Agreement; No. 2, Fumigator's Report; No. 3, Time-book. Thus the Superintendent, as

well as the Horticultural Commissioner, has a complete record of the scale found and treated. Its location in the orchard and the record of its treatment is a guide to future inspections, and an aid in learning the efficacy of certain doses, etc., for trees of a given size.

Eternal vigilance is the price of liberty; it is also the price of clean trees, and you must exercise it in your own orchards and neighborhoods, if you make a financial success of fruit raising. It must *begin even before you begin your orchard*. Agents of Eastern firms are contracting to deliver diseased trees to you. Unless you exercise "eternal vigilance" and keep them out, your hopes and prospects are blasted from the very start.

The Horticultural Commissioners of the State are giving their best thoughts and work to protect and advance the fruit interests of the State. Aid them by every means in your power, and by constant and earnest coöperative effort the growing and marketing of fruit shall be made more of a pleasure and more of a financial success in the near future than it has been in the past.

DISCUSSION ON INSECT PESTS AND REMEDIES.

MR. WYER: I would like to know if we must use the best sulphur?

MR. BUCK: I do not think it makes any difference as to the quality you use, because if you use the cheap sulphur there is more sediment than in the other sulphur, so that I never could find a great deal of difference.

MR. MOSHER: I have had some experience in mixing up this lime, sulphur, and salt, and I think it is a common error we make in not boiling sufficiently. I notice that where I have boiled it for five or six hours that the sulphur is thoroughly dissolved, and it makes a chemical change. I know when I have been riding by orchards I could tell by the trees whether the wash on them was thoroughly made. I would like the sulphur dissolved so that it could combine with the sap of the tree. I don't care to use the lime.

MRS. McCANN: I think there is one benefit in using the lime, and that is, it shows where the work has been done. I would like to ask the gentleman how many times they spray with this mixture, and if he considers it to be thoroughly effectual for the pernicious scale and the codlin moth?

MR. MOSHER: I do not believe in spraying at all. I believe my orchard compares favorably with my neighbors'. I think they have sprayed too much. I merely wash my trees; sometimes I use a spraying machine. I never spray below the lower branches. I know the sap goes up into the limbs, and I think this wash combines with it.

MR. CLARLIN: I know the sulphur remedies are the best to be obtained for spraying, but we have very little use for it. We found it necessary to spray twice to kill all the scales, and the time we prefer to have that done is when the leaves fall off in the fall and then in the spring; it is difficult to kill all the scale, for there will be some spots on the tree left untouched, although the men who are doing the work go over it two, three, or sometimes four times.

MR. BUCK: I will say that we have used the lime, sulphur, and salt wash, and found it very effectual. I was in my orchard Monday of this

week, and I could not find, nor did find, a single live scale, nor did I see a scale in the sample of fruit that came out of our orchard this year. In answer to Mrs. McCann's question, I will say that lime, sulphur, and salt do not affect the codlin moth materially; but if the lime, sulphur, and salt wash is prepared properly, I believe it to be absolutely a sure cure for the pernicious scale. I do not agree with some fruit growers; I believe the lime has something to do with it, and I believe that the assimilation of the lime with sulphur is the thing that kills them.

MR. MOTHERAL: We boil the lime and sulphur together until they thoroughly unite and the liquor becomes an amber color; then we add more lime, sulphur, and salt for the purpose of making the whitewash, and stick it on the tree. My theory is that the last addition does not amount to anything, but it must be boiled. I have experimented some at different periods of the year in Tulare County, where they do not now have scale. Three years ago they destroyed our trees until our fruit orchards had almost disappeared; now our orchards are all clean, and we have adopted this plan of spraying—just as soon as the leaves fall. After that period the parasites live upon the pernicious scale, which are in the ground, and not upon the trees at all, and these bugs are in the ground housed for winter, and if you wait until February they are out and on the trees and laying their eggs preparatory to their work in the spring. If you spray with lime, sulphur, and salt it ought to be done in December, and if you do that you will have no scale.

MR. BLOCK: I believe in using lime, and a good deal of it. I find the I X L Santa Cruz lime is about as good as any. It is not the finest for house use, but you want caustic lime—as caustic as you can get it. I would suggest that you put in your salt and sulphur together, as it will dissolve much quicker.

MR. GRAVES: I would like to know what success has been had with the I X L wash. I have read that it has not been a success.

MR. CLAFLIN: In Southern California we have given it a fair test, and it has been proved to be unreliable; in some cases it did the work, but in most cases it did not.

MR. GREEN: I differ with some of the gentlemen in regard to the sulphur used. I experimented last winter with the California sulphur, the Eastern sulphur, and the French sulphur. I tried the California sulphur on a hundred pear trees, also a hundred trees with the Eastern sulphur, and a hundred trees with the French sulphur; the result was the trees sprayed with the French sulphur had less smut on them.

MR. ALLEN: A good many years ago I did know something about chemistry, and if we understood the manner in which it acts I believe it would reconcile us in our differences. The scale is laid under a cover—not exactly gum arabic, but something like it—and while it is thus protected no wash put on the outside that does not dissolve that cover, or loosen it up, will kill the egg. Now, the purpose of the lime, I take it, is to dissolve the mucilage around this scale, as well as to loosen them up, so that the sulphuric acid, which is the effective part of all this, can do its work in killing these insects. The virtue in killing any of these must come from the sulphuric acid of the sulphur, or from the caustic properties of the lime. Those of you who use sulphur on your grapes know it is not the sulphur that does the good, but it is the vapor that comes from the sulphur as it is vaporized through the air and disseminated for days and weeks after you put it on your vines. So it is

this sulphuric acid gas, you see, that kills all this life. Now, as to the lime wash, you have to put that on just where the evil is; but the sulphur will act three or four feet in every direction. The virtue of the whole thing comes from the gaseous substances, and the purpose of the admixture is to hold the sulphur in place, so that it does not all fall down on the ground. The whole purpose of this is to dissolve the mucilaginous covering. If you can spray at the right season, when the insects begin to move from the shell, then you can kill them with sulphuric acid gas; but you want to hold it in solution and give it a chance to slowly vaporize, as it does constantly in the air. It vaporizes very rapidly when the sun is very hot, and rises very slowly when it is cool.

MR. MOSHER: I would like to ask, when winter approaches, at the time the tree puts on its winter coating, and the scale puts on its winter covering also, if we put on anything to take off this hard shell of the scale, will it not also take off this outer covering of the tree that nature has put on it to preserve it during the winter? I have noticed that the trees that were washed did not do well, as they seemed to take on a sickly look, like a person just getting over a fever. If you wait until spring, when the sap begins to come up into the tree, then the bark is thrown off and the shell opens, and the scale begins to move, and I think that that is the time to put on your wash, for then it combines with the sap of the tree. I washed the pear trees at that time, and I noticed after doing so that the scales were all dead.

MR. MOTHERAL: I would like to ask Mr. Mosher if he tried the experiment of boring a hole in the tree?

MR. MOSHER: I have heard of it.

MR. LELONG: I can cite an instance in Los Angeles County. About eighteen years ago there was a man came around and he wanted to kill all the bugs on the trees at so much a tree. Mr. Shorb tried it on his orchard. He bored two or three holes in the tree and plugged them up, and you can go there to-day and gouge the plugs out, and you will find the sulphur in just as perfect a state as the day it was put in.

MR. MOSHER: I think it would be better to dissolve the sulphur, so as to combine with the sap.

MR. CLAFLIN: The Horticultural Commissioners and the fruit men who have given this matter the closest attention, will agree, with hardly an exception, that it is impossible to get anything into the sap of the tree, either by placing it on the outside of the tree, or by boring the hole and putting it into the tree, so that it will be conveyed so as to destroy the scale of the tree. If that is the case it must be from the work of the parasite, and not from the application of lime, sulphur, and salt.

PEACH YELLOWS.

By W. E. COLLINS, of Ontario.

The successful horticulturist is not only an observant man, but pursues his observations and experiments to an intelligent and successful conclusion. He knows the characteristics of each variety, and notes carefully every irregularity in growth or development of tree or fruit. The peach grower must familiarize himself particularly with the color

and time of ripening of the fruit of each variety, not only that he may select the varieties best calculated to produce the results he aims at in marketing by having a succession of ripenings, but to be able to detect any departure from normal conditions. "By their fruits ye shall know them." The first indication of yellows is manifested usually in the fruit; it ripens from three days to six weeks too soon, but as a rule from two to three weeks. Healthy peaches grow rather slowly till a short time before maturity. Then they increase rapidly in size, and all ripen about the same time. The diseased fruit sometimes ripens in such a way that they all ripen at once, irrespective of variety. Thus, the Early Crawford and Smock may mature at the same time. The discoloration of the diseased fruit is also variable. Instead of the delicate, minute dots or uniform mass of color of the healthy peach, it is coarsely blotched, speckled, or mottled with red and purple spots about one sixteenth of an inch in diameter. The flesh, also, of both the white and yellow varieties is mottled, streaked, or spotted with crimson to a greater or less degree. Later in the season the trees show a tendency to push out lateral shoots, especially from obscure buds on the new growth, sometimes to such an extent as to give the affected limb a tufted appearance at its extremity. The leaves, instead of being plentiful, normal-shaped, and healthy in color, are dwarfed, red-spotted, and fall prematurely. These are the general symptoms of the first year. Only a peach or two, or a small limb or two, may be found affected.

The second year there is a marked progressive development of the symptoms exhibited in the first year; the fruit is smaller and less abundant, and the pit is often misshapen. The disease affects a greater portion of the tree, often a smaller portion being free than was diseased the first season. Diseased shoots continue to grow from the affected limbs, those of the previous year, if any grew, being for the most part dead. The foliage is more dwarfed, yellowish or reddish brown; and on that affected the previous year, more or less curled or inrolled. This curling or rolling does not usually appear on the diseased summer or secondary shoots.

The third and later years are marked by the death of large limbs, and finally of the entire tree.

These are only the general symptoms to be seen as the disease progresses. Others are to be found, but are so variable that it would require too much space to enumerate and describe them so as to be of any value. I should state that in the first year the tree is not always affected, more frequently only the fruit, and it may be only two or three specimens, or the limb may also show it to such an extent that it makes no preparation for winter, but continues its abnormal growth. The diseased wood has a starved appearance and is brittle. Professor Smith gives the following

DIGEST OF SYMPTOMS.

(Page 8 of *Treatise on Yellows*, by B. M. Lelong, August, 1891.)

- "1. Prematurely ripe, red-spotted fruit.
- "2. Development, upon the trunk and branches which bear, or have borne, the diseased peaches, of secondary or summer shoots, often in great numbers and always dwarfed and feeble in appearance.
- "3. A very marked tendency of the buds on these secondary shoots to

develop the same season, forming sometimes in this way, within a few months, secondary, tertiary, quaternary, and quintan branches.

"4. The appearance of the disease the next spring, in the entire growth of the tree, or at least of the diseased parts, the shoot-axes being shortened and the foliage dwarfed and sickly, of a yellowish or reddish brown color, and with a greater or less tendency to curl from end to end and to roll sidewise, so that the lower surface becomes the convex outer surface. Sometimes, however, the disease affects the terminal shoots the same autumn, causing the winter buds to develop either before or after the leaves have fallen.

"5. A slow progress of the disease from limb to limb, so that in one or two years, or at the most three years, the whole tree is involved.

"6. Coördinate with the progress of the disease from part to part, a marked diminution of the vitality of the tree, ending in death.

"These are symptoms characteristic of peach yellows, and they seem to me quite as definite as those of any specific disease. If peach yellows, as I have seen it and defined it, is not a specific disease, due to some constant cause or causes, then neither is glanders nor anthrax nor measles nor smallpox."

ITS CAUSES, REMEDY, ETC.

We would indeed be happy if the cause of this terror of peach growers could be as easily ascertained and narrated as its history. The remedy would then be at hand, and with a careful application certainty of effect could be counted on, and the grower rest easy that his income would not be decreased materially. Unfortunately, however, like our unnamed vine disease, it has baffled all scientific and practical effort to determine its cause or prescribe a remedy. Years ago it was frequently mistaken for other diseases, notably, borers. Many writers have attributed its cause to soil exhaustion, others to climatic causes, floods, droughts, frosts, etc.; others, again, to excessive cultivation or pruning, neglect of both, injuries of various kinds, defective drainage, propagation from buds rather than from seeds, use of animal manures, micro-organisms, etc., but Professor Smith, from his experiments and investigations, seems to have satisfied himself, at least, that all these hypotheses must be barred. And from personal correspondence with leading horticulturists in the Eastern States, I am led to infer that they coincide with Professor Smith's views.

But in the face of these views held by such able and experienced men, I think the theory of soil exhaustion and in-budding has not been disproved, and I will attempt to explain: In cereal crops we know the best results are produced by a rotation of crops, because if a succession of the same crop be grown on the same land, it results in a decreased yield through exhaustion of the soil. If a tree be planted, it remains in the same spot until removed, and there is no rotation possible. The roots soon take up all the nourishment there is in the soil for tree growth. The only possible opportunity there is for it to get plant-food is by the extension of its roots and rootlets, or from application of manures in some form—in time the roots of adjoining trees interlace; thenceforward the growth must be largely made from artificial applications. Now, here is one point. There is nothing so fully imparts to the soil all the requisites of plant-food as natural manures, but the supply is limited;

hence, resort must be had to artificial products. The soil, plant, and fruit are analyzed in order to determine the component parts that are to be supplied in greatest quantity for the particular purpose, but analyses are misleading. We know, for instance, by using certain proportions of oxygen, hydrogen, and carbonic acid gases water can be produced. We also know an expert chemist can analyze Portland cement, and by using exact proportions of the same ingredients determined by his analysis fail to produce Portland cement, because one ingredient is entirely eliminated by heat in the process of manufacture of the genuine article; hence, cannot be found by an analysis of it. So in soil there may be an essential chemical agent which is not discovered by analysis, but which is necessary to the production of a proper fertilizer.

Again, soil exhaustion may be, and undoubtedly is, brought about more rapidly by overbearing, especially in young trees. This is a characteristic of budded or grafted trees. In the early history of the disease, the trees were all seedlings and it made slow progress. With the advent of propagation by budding, it spread more rapidly and attacked younger trees. This may be accounted for in part by the buds having been taken from trees which, at the time of taking them, exhibited no external signs of the disease, but more recent experience seems rather to disprove this theory. Budding dwarfs the tree, causes the wood to mature and bear younger than the seedling stock would, which results generally in precocious bearing, hence a deterioration of vitality, which, coupled with soil exhaustion proper, renders the tree more susceptible to attacks of disease.

Professor Smith, while acknowledging that in-breeding has been established as a cause of deterioration in animals, discredits the theory that the same law or the prolonged reproduction by buds, or in-budding, has any effect on plants or tree life from the difficulty of deciding what constitutes an individual. But it seems to me, analogously, they are the same. It seems reasonable to suppose that if a bud be taken from a perfectly healthy tree and inserted in healthy stock, and again from that tree buds are taken and inserted on other stock, and so on indefinitely, while the characteristics of the fruit will be preserved, and its quality maintained by cultivation and other means, it must result in the vitality, or longevity, being gradually depreciated. Then couple with that the method widely practiced of growing stock for budding purposes from seed gathered indiscriminately from culls, windfalls, or budded fruit, and we have a result that cannot but be fraught with bitter disappointment. Professor Smith practically supports this theory by stating that young budded trees are more quickly attacked and more readily succumb than old seedlings. To avoid this it is necessary from time to time to go back to the parent tree for buds and to the natural tree for seed. So, in soil exhaustion, tree exhaustion, and in budding I maintain we have causes, not only for deterioration of stock, but for the production, possibly, of the yellows and other mysterious diseases, which have not yet been disproved, at all events, by the literature which has come under my notice.

In discussing soil exhaustion as a cause, Professor Smith attributes to both Dr. Goessmann and Professor Penhallow error of logic in concluding from analysis, that a deficiency of potash was the cause, and asks: "May this deficiency not have been an effect of the disease rather than a cause," and proceeds to argue that a sufficient number of analyses

have not been made to warrant the conclusions of Dr. Goessmann, and that from present information "it is not known that trees stunted by borers, or by root aphides, or by starvation, would not yield chemical results identical with those given by trees suffering from yellows."

T. V. Munson, of Denison, Tex., in a letter to me, advises liberal use of potash fertilizers as a preventive, which would seem to imply that he agrees with Dr. Goessmann. Professor Smith gives, as illustrating his position, the treatment given several orchards in which kainit, potash, and other fertilizers were used two, three, or four years, but he does not show that the amount used was sufficient to restore and maintain the proper proportion of potash to the soil. In animal life we know that if the progress of a disease can be arrested, or has run its course and the patient has sufficient vitality remaining, he will recover. May the same not be true in vegetable life? If it be, is it not logical to conclude that if the soil be restored to the normal condition necessary for its subsistence, that the tree also will recover and throw off the disease? This raises, also, the question of adaptation to climate as to natural conditions, which is not within the purview of this letter.

Recess till 2 o'clock P. M.

AFTERNOON SESSION.

Acting President Buck in the chair.

DESTRUCTION OF FORESTS AND REFORESTATION OF THE COUNTRY.

By JOHN H. FOWLER, of Santa Rosa.

The last census, showing the rapidity with which the pine forests of the Northwestern States are being exhausted, has given renewed interest to the subject of forestry. When we reflect that a generation ago the forests of Michigan, Wisconsin, and Minnesota were regarded as inexhaustible, and then contemplate the immense drafts that have been made upon them during the period named, to build up such great cities as Chicago, St. Louis, Detroit, St. Paul, and the countless other cities and towns, together with the vast network of railroads that cover the territory supplied from those forests, it is not surprising that such inroads have been made, or that people who have given thought and study to the subject should discover that the end is near, and that it is high time that the people of this nation should earnestly consider the subject of forestry.

The fact that our population is rapidly increasing and the demands upon our forests increasing in like ratio, forces upon us the inquiry, How long can we continue to pursue our present wasteful methods of cutting, burning, leaving to decay, so much of our timber and make no provision for the restoration of the forests, without great injury to the future welfare of the nation and justly incurring the censure of those who shall occupy this land but a few generations hence? They will surely reproach us for our want of foresight if we, who inherit

a land rich in the variety and abundance of its forest supplies, with vandal hands destroy this rich inheritance and leave only to them bare mountains, barren slopes, and sandy plains, where our vast wooded tracts once stood in verdant beauty and priceless value. If it be true, as the census of 1890 shows, that there only remains in private hands in the three great lumbering States of the Northwest a supply of pine timber for five years more, reckoning at the present rate of consumption, does it not argue, with unanswerable logic, that the State and Federal Governments should at once take measures to secure what they control from hasty and unprofitable destruction? Lumbermen throughout the country, and particularly in California and on the Pacific Coast, complain of the low price of lumber and the want of markets for the milling capacity of the country. In consequence, we have lumber forced upon the markets in great quantities, at the bare cost of manufacture, and no value returned for stumpage. This has been a fact for a large part of the period in which the business has been conducted in this State. Some few firms favorably located for shipping, and either getting standing timber from government land without paying for it, or getting it at a merely nominal price, have considered only the cost of manufacture. This has forced competition to adopt like methods and accept similar prices; hence, only the choicest trees were cut and only the best logs out of them taken, while the torch has been ruthlessly applied to the destruction of the remaining portions. The aim has been to secure choice logs with the least possible labor and expense, and with but little regard to the value of the standing timber. When timber could be taken from government lands, without risk and without compensation, that would yield from one hundred thousand to five hundred thousand feet of sawed lumber per acre, or purchased at a price per acre less than the price of a day's wages for a teamster or chopper—that is to say, for \$2 50 per acre—there was very little encouragement, in the face of sharp competition, to be saving of the timber.

This State has sold much of its timber land at one half the price obtained by the Federal Government. Hence it appears that, while we have a Forestry Division in one of the departments of the General Government, which, in the language of the Chief of that division, is said to "have been conceived for the purpose of specially interesting itself in the proper development and maintenance of one of her choicest natural resources" (the once so-called "inexhaustible" forest wealth), and a State Board of Forestry, presumably created to do similar work for the State, yet the State and nation may be said to aid and abet in this wanton waste by virtue of the want of more effective work in preventing timber stealing and the nominal price put upon its timber lands by the nation, and the practical giving away of its choicest timber lands by the State, since the price received for such lands amounts to almost nothing in comparison with their real value.

That which costs nothing is very apt to be regarded as worth nothing. The lumbermen reasoned, We got the timber for little or nothing, consequently it is not stumpage that cuts much of a figure in our operations; but how shall we make the most high-grade and high-priced lumber at the least cost of manufacture? The answer to the question seems to have been: saw clear logs as far as possible and burn the rest, since it costs no more to saw and ship a thousand feet of clear lumber worth \$30, than to saw and handle a thousand feet worth only half as

much. The low price of lumber in the market may have, and probably has, encouraged wastefulness on the part of the consumer, and thus there has been loss at both ends.

The great Burke said: "Every new advance of the price to the consumer is a new incentive to him to retrench the quality" (and I may add the quantity) "of his consumption."

The millman gets his timber cheap and, per consequence, the consumer gets his lumber cheap, and both are wasteful, the former, however, much more than the latter. What can the State and nation do to remedy this? The answer plainly is: *First withdraw all State and Federal timber lands from sale.* This will withdraw from competition with lands in private hands that which tends to depress the value of all other timber lands as long as they are offered at the low government valuation, and by enhancing the value of timber lands and stumpage would necessitate more economical methods on the part of saw-mill men, besides preserving for future use a part of this wealth which is now being squandered.

If to this reasoning some should object on the score that it favored legislation which would enhance the cost of lumber to present consumers in the interests of our successors, it must be answered that governments are formed and this nation exists not for one or two generations alone, and that it is the work of Legislatures to protect the State from the avarice and wanton aggressions of the individual members of the body politic. The statesman who will be honored by posterity will be him who exercises a wise forethought for future interests and the permanent welfare of the people.

The forests may be regarded as a trust. The lands in the ownership of the State and nation have been bestowed with lavish hands upon the people, until the period has arrived when it becomes necessary to stop and consider the consequences to follow if this course is continued.

If it is true that nations are like individuals, it is just as unwise and impolitic for this Government to squander its forest wealth, in the face of the facts of rapidly increasing population and certain future requirements, as it would be for a man having a large family of dependent sons and daughters, and owning broad and fertile acres, overflowing granaries and a long bank account, to spend it all in riotous living and leave his heirs in poverty, on the plea that poorhouses and charitable institutions were provided for the needy; and the legislator who refuses to raise his voice in behalf of the conservation of the riches stored in our forests, when convinced of its truth and necessity, is just as reprehensible as would be the individual acting in the manner described.

It is natural for man to desire to increase his possessions, and if he can do so more rapidly by wasting what he cannot profitably use, he will most likely do so. The desire to accumulate wealth in honest and honorable ways is healthful and commendable, and should be encouraged; but the honest and patriotic citizen intrusted with the responsible duty of guarding the interests of the State is in honor bound to see that the interests of the commonwealth do not suffer at his hands.

In this State nothing calls for more earnest consideration by those who make and administer our laws than the investigation of the question under contemplation; and the more the masses reflect upon and study this subject the more earnestly will they demand legislation of

this character. It must be done quickly, too, or it will be forever too late, as an Act withdrawing lands from sale after they are all sold will simply be locking the stable door after the horse is stolen. The State has an enduring interest in her forest areas, which in various ways affects her agricultural, climatic, and material prosperity, whereas individuals have only a life interest. Which shall the people make paramount? We are not only called upon to act in regard to lands already heavily timbered, but questions of afforestation and reforestation are both important in California. It includes within its bounds extensive mountain ranges, broad fertile valleys, and vast arid plains. The tree growth of the Sierras differs from that of the Coast Range, and the valleys and plains are, for the most part, treeless. Each district presents a different problem for consideration. In the Sierras we must guard against forest fires, and prevent sheep-herding on public lands—the former destroying both old and young growth, and the latter devouring every green sprout whereby the forests might eventually be restored. On the plains afforestation can only be accomplished through the aid of the nursery, proper preparation of the soil, and irrigation. If not all of these agencies are required at all points, some of them, at least, must be employed. In the redwood belt reforestation can be easily and successfully accomplished from seed and stump. Writing from the redwood district, I shall speak only of the latter method.

The northern boundary of the State is the forty-second parallel of north latitude, and this coincides almost exactly with the northern limit of the redwood belt. It is a fact that all the redwood in the world is found in the State of California, and by far the greater portion of the redwood acreage lies in the counties of Sonoma, Mendocino, Humboldt, and Del Norte. While heavy bodies of redwood reach to a point within two or three miles of the Oregon line, the tree is rarely found on the north side of the line, and only a few small groves and scattering trees occur there. Hence, the redwood must be regarded as a special endowment by the Almighty to this, our more than favored State. What a boon it has been and is to us! Note the thousand purposes to which it has been applied in building up our commonwealth, and the gold it has brought to our coffers, and tell me, in view of all the facts, if our management of this endowment does not amount to sacrilege.

A very large per cent of the land upon which redwood grows is rough mountain land, wholly unfit for cultivation. Some of it consists of table or bench land bordering the ocean, and some level land along the streams. Between the two extremes are found no inconsiderable amount of gently rolling hills and easy slopes.

As the forests in this region are so dense, and usually so completely cover the whole country, both from economical and climatic standpoint, the country will be benefited by the clearing and cultivating of a portion of the land. Already the timber has been removed on nearly all the table land along the coast, and most of the land adjacent to the streams. Not a little of this land has been utilized for agricultural purposes. The redwood is a persistent grower, and the land is hard to clear. The roots spread in all directions, and penetrate the soil deeply, so that the practice of digging out the stumps is rarely resorted to. The usual method is to pile up around the stumps all the refuse obtainable and make as hot a fire as possible. As green stumps will not easily burn, and do not die or dry of themselves, it usually happens that the

sprouts start up from the stumps in profusion the following year, and must be chopped off and allowed to dry, and the firing process repeated, perhaps three or four times, before the killing can be effectually accomplished. Owing to this habit of the tree to reproduce itself by suckers starting from the stump, a very thrifty growth of young trees can be obtained, with very little labor or care, in a very short time. Here no planting is necessary, and no fences required to protect them, since neither cattle nor sheep will feed upon them. They want no irrigation, and simply require to be let alone. Keep fire away as far as possible, and if it is desired to render aid to the young growth, about all that can be done is to chop out the surplus sprouts (selecting, of course, the weaker ones) during the earlier stages of growth, and as soon as the leaders attain sufficient size and strength they will absorb the life-giving power of the stump. In this way from four to ten young trees may be grown where one stood before. As the new growth is nourished by the wide-spreading roots formerly required to support the parent tree, it usually makes a very rapid growth, and in fifteen or twenty years from the time of starting will furnish timber suitable for piling, fencing, and various other useful purposes. It is reasonable to suppose, from a financial standpoint, that no better use can be made of much of the land now being cut over than to encourage this effort of nature to restore our redwoods. Where the lands are favorably located with regard to shipping facilities, the returns for the second crop could, in many instances, be made to exceed the profits of the first crop. This is predicated upon the presumption that in fifteen, twenty, or, at most, twenty-five years hence, our redwoods will be to California as are now the pine forests of the Northwestern States to them. There the pine tree will not reproduce itself, and it is a question of no small importance, in Michigan for instance, what can be done to restore value to the square miles of sandy, barren plains whence the timber has been taken.

In support of this statement, let me point to instances which have come under my own observation. Near the farm of B. F. Tilton, in Green Valley, Sonoma County, there stood in 1853 a clump of redwoods of moderate size. About that time they were felled. Around the stumps sprang up a beautiful growth of sprouts and suckers. These were left to grow at their own sweet will. From time to time poles have been taken from the clump as wanted, and at the present time, on that small area, not exceeding twenty-five square rods, stands a beautiful grove of a hundred or more tall, straight, symmetrical trees, measuring from twelve to eighteen inches in diameter at the butt, and from fifty to seventy-five feet high, forming a charming background to a cozy little cottage which has been erected near by, and affording delightful shade to man and beast when noonday suns oppress, and a perfect wind-break when the west winds blow. The trees are worth for piles \$1 a piece where they stand. What would an acre yield at this rate?

Mr. Tilton informs me that in 1856, when he came into possession of his farm, he cut down a redwood near where his barn now stands. Beside the tree was a small sprout, which he allowed to grow. It was then about four inches in diameter, and twenty feet high; to-day it is two feet in diameter, and its green plume waves in the air one hundred feet above.

Six years ago, Messrs. Guerne and Murphy cut the trees on a flat bordering on Russian River, near Guerneville. They decided to seed

the land between the stumps to grass, but refrained from piling the refuse against the stumps, in conformity with the usual practice, in order that the new growth from the stumps might have a chance to live; the inducement being to restore, in a measure, beauty to the grounds, which, before the cutting, had been very attractive as a place of resort for pleasure-seekers and picnics. The debris was piled and burned, and after the work was done a more desolate and unsightly place could hardly be conceived. Nothing but great blackened stumps and burned soil and ashes. The grass seed was sown, and the stumps left to the tender hands of Dame Nature. The winter rains washed away the ashes, and sprouted the grass seeds, which soon carpeted the intervening spaces. Over the burned and mutilated stumps the benign mother wove a mantle of green, and in two years their hideous wounds were hidden from sight. Mr. Guerne says that now much of the new growth has reached a height of from twenty to twenty-five feet, and is from six to eight inches in diameter. The grounds now have an attractive and park-like appearance. The change from six years ago seems almost magical.

Mr. Guerne further informs me that numerous sprouts are now growing over and around each stump. That as they grow older, from four to ten to each stump will survive and overtop the others, which will succumb to the shade and vigor of the leaders, and in a few years the strong growers will alone remain, and just such a production will appear as that in Green Valley, just described. Other and probably more remarkable examples might be cited, but these will suffice.

In regard to the possibilities of our soil in reference to reforestation by natural seeding, I will ask your indulgence while I note some facts which I have witnessed since I came to the State in 1854. In the summer of that year I frequently rode over the country and neighborhood where the town of Sebastopol now stands. At that time the land was occupied with scattering oaks and clumps of manzanita, with wide grassy openings between. A person could drive with horses and wagons wherever his inclination led him. Ten years later I rode through there with the late Dr. T. M. Ames, a pioneer of 1846, and he remarked to me: "When I first knew this country it was all open land, and now see how it is growing up to fir. Why, a man on horseback can't get through it at all if he leaves the road." Yes, I replied, I have noticed that. Why is it, I asked, that these fir trees grow so abundantly now where they never grew before? He answered that formerly the territory was frequently burned over, but since the country had become thickly settled by Americans, they had kept the fires down, and the trees had quickly sprung into existence. Six years later Mr. Adam Crawford purchased the land where this conversation occurred, and cleared it off for a fruit orchard. This was in 1870, and he states that it averaged seventy-five cords of wood per acre, some of the heaviest yielding two hundred and fifty cords per acre. The land was set to fruit trees, and the orchard has been yielding fruit for sixteen years or more. Grassy, open land, thick forest growth, old bearing orchard, all on the same land, and all within the period of my personal knowledge, and the brief space of thirty-seven years.

Some of these lands where the trees have been allowed to stand to this date will yield three or four hundred cords of wood per acre. What further proof can we ask as to the capability of our soil for

natural reforestation? Given a warm, sandy soil, a coating of grass, keep down your fires, and presto! you have a fir forest.

Would it not be well for the State to foster this natural reforestation? Comparatively few individuals feel willing to wait from fifteen to twenty-five years for a crop to mature, even though it be shown that lands worth from \$2 50 to \$5 per acre may be made to yield a harvest in that time worth from \$150 to \$200 per acre, possibly more. Although I am fully convinced that such an investment would prove highly remunerative, and that no better legacy could be left to our sons (except it be original timber lands), yet it does not seem to have attracted, as yet, the attention it deserves.

The great State of New York, recognizing the necessity for action in this line, has, through her Legislature, made a liberal appropriation for the purpose of purchasing timbered lands and lands that have been cut over, and has withdrawn her timber lands from sale. California should follow her example. Let her purchase some of those denuded redwood lands and place them in charge of the Forestry Board, with the object of setting an example, and proving the practicability and profit of this method of restoring redwood forests. Let her exempt from taxation, for a reasonable period, such lands of this character as individuals, under proper rules, may desire to maintain for this purpose.

The Federal Government has withdrawn a few sections of land in Tulare upon which the sequoias grow. Will the State in like manner save to herself a body of great trees? Does any of our millionaires seek to live in grateful remembrance in the hearts of the people? Let him donate to the State as a perpetual trust one thousand acres of *Sequoia sempervirens*, and it will be in fact, as the name implies, a living monument.

The noble sequoia is rightly termed the "Monarch of the Forest." The white man, boasted champion of progress and civilization, comes to these shores with double-bitted ax, double circulars, and band saws. He invades the domain where they have reigned supreme for twice a thousand years, and the sturdy monarchs fall before the invading army like grass before the scythe. Verily, "With torch and ax we make a wild sport of their blazing thrones." Shall the glory of the redwood pass away with the nineteenth century? Is the ocean that now beats with ceaseless roar along these glory-crowned mountains chanting his funeral dirge?

Hush! hush! the Redwood's dying.
Hark! through old forest dim
The wailing winds are sighing
Their requiem over him.

PEACH YELLOWS—(Resumed).

EASTERN PEACH YELLOWS.

By B. M. LELONG.

The future of successful fruit growing in California depends upon preventing the various fruit tree diseases so prevalent throughout many of the Eastern States from being introduced into this State. Importing trees from the East, especially from States where the yellows has

appeared, is very dangerous, and every person interested in the future of fruit growing in this State ought to discourage the practice in every way. There is no certainty that nurserymen in the East do not run short of nursery stock and are supplied from other States to fill orders from this coast. Also, there is no guarantee that dealers do not buy cheap trees from suspected districts and forward them as coming from perfectly clean localities. To be safe no person should buy imported trees, unless they are known to have come from localities absolutely free from the yellows. The yellows is spreading throughout the East with great rapidity, and is most alarming, threatening the destruction of the peach industry everywhere. The disease now prevails from Massachusetts to Virginia, and westward to the Great Lakes and the Mississippi River. The peach-growing sections of Massachusetts, Connecticut, New York, New Jersey, Ohio, Delaware, Maryland, Virginia, Kentucky, Indiana, Illinois, Michigan, Arkansas, Pennsylvania, and northern Texas are suffering from its ravages, and so far nothing can stop its destructive course; it is a most singular and obscure disease everywhere.

I could point out the damage done by this destructive agent in all the districts where it has appeared, but believe it would only be time wasted. As illustrating, one example will apply, to a certain extent, to all the rest; I therefore will only mention New Castle County, Delaware. This county has always been considered the largest peach-growing region of the East, and in 1879 the acreage devoted to the culture of the peach in that county was estimated at eleven thousand six hundred acres, but since that time this area has been steadily on the decline, caused by the yellows. In 1888 no orchards of any consequence were found between Middletown and McDonough, which formerly was so thickly planted. Large districts, once almost entirely devoted to peach orchards, are now bare and do not contain a single tree. It was estimated that there were one million seven hundred and fifty thousand trees in New Castle County in 1875, and six hundred and thirty-two thousand four hundred and twenty-seven baskets of peaches were shipped that same year. New Castle and Middletown are no longer the center of the peach region, and the peaches now shipped from there are hardly taken into account. Speaking of Delaware City and Middletown, Dr. Smith says: "The 'glory and profit' of peach growing have departed, and under the same blighting influence." The damage caused by yellows extends to all the other counties in Delaware, and also in the States above mentioned in no less destructive form.

In June, 1890, I visited the principal peach-growing regions of the East, and especially those of Delaware, Maryland, and New Jersey. The great number of orchards that had been rooted out, on account of being infected by the yellows, was really appalling. Vacant fields could be seen everywhere (now principally devoted to cereals) that once were peach orchards.

Large orchards that once were very productive have been swept out of existence by the scourge. Thousands of acres have been taken out, and many more will be uprooted and burned. The scourge is also doing havoc in many sections where, previous to 1888, it was not known to exist. Such remnants of orchards are seen everywhere, and the stumps remain only as evidence of the destructive work of this scourge.



The newspapers of the East have recently announced that an English syndicate has secured an option for the purchasing of a number of the larger nurseries in western New York, and also that the project con-

templates the absorption of some of the best known nurseries of Rochester, Geneva, and Lockport, besides others, and to place on sale their trees wherever they can. It is a scheme to buy and sell, no matter from where or to whom.

That there is danger of introducing the disease on nursery trees cannot be doubted, from the fact that in the East it has been taken from one locality to another in this way, the trees developing the disease the same season after planting.

The first cases of yellows that have been found in new districts are generally, if not always, in young trees imported from infected localities. "Yellows is a disease of haste and waste; the fruit ripens too soon, the buds push too soon, assimilation is disturbed, the stored starch and other food materials are wasted by excessive and unnatural growth, and the entire vitality of the tree is exhausted in the course of two or three seasons."

This State is thus far free from the disease, and the introduction of all trees from the Eastern States should be prohibited by stringent legislative enactments and county ordinances.

From time to time we have warned fruit growers of the danger of introducing dangerous insect pests and diseases not known in this State, yet, strange as it may appear, and in the face of all these warnings, many persons are eager to buy trees grown outside of the State, principally on account of their cheapness. There are many large land owners and real estate speculators in the State interested only in the speculative value of their land. They do not care for the fruit industry, and will plant those trees which are cheapest, so as to have a large acreage of planted trees. These lands are sold at great profit, and dangerous pests and diseases are liable to be thus introduced on inferior and infected imported trees.

The yellows is a constitutional disease of the peach and nectarine, prevalent throughout many of the Eastern States where the peach is grown, and peculiar to America as far as known. It has also been observed on the almond and apricot.

"Within a few years after it was described, yellows appeared in all the Atlantic Coast States north of Virginia, and caused great loss, destroying in a few decades hundreds of orchards and thousands of trees in Delaware, New Jersey, Pennsylvania, New York, and Connecticut, and putting an entire stop to peach growing in many sections."*

Dr. Erwin F. Smith, the Special Agent of the Department of Agriculture, to whom the investigation of the yellows has been especially assigned for several years, in 1888 reported that the disease had extended from Maine to Georgia, and westward to Lake Michigan and the Mississippi River, and that in recent years it appeared in Michigan, Illinois, and Georgia, and has not disappeared from any of its former strongholds. "In recent years the disease has been no less destructive than formerly. Thousands of young and thrifty trees have been destroyed by it, and peach growing has been abandoned in several parts of the country, where formerly there were many large and profitable orchards; e. g., at Saint Joseph, in Berrien County, Michigan; at Middletown, in New Castle County, Delaware; near Niagara River, in New York and Ontario, and along the bay shore in Hartford County, Maryland. The disease

*Report of Erwin F. Smith on the yellows, Bulletin No. 9, Division of Vegetable Pathology, Washington, 1888.

now prevails disastrously on the Chesapeake and Delaware Peninsula, in the most productive peach region of the continent. On this peninsula it is confined principally to the counties of Cecil and Kent, in Maryland, and of New Castle and Kent, in Delaware, but is extending into other regions formerly free. The disease is also now prevalent in Cumberland, Morris, and Hunterdon Counties, in New Jersey, and in other parts of the United States. It is everywhere the same obscure, destructive malady."*

Thus far mycologists have failed to ascribe the cause of the yellows. It has, however, been attributed to various causes, such as severe freezing in winter, excessive rainfall, precipitation, parasites, etc.; but these causes have been carefully looked into and the yellows found thriving under all such conditions. All the combined efforts of the experts employed have not yet detected the cause of the malady, nor effected a cure in a single instance.

"It has been attributed to impoverishment of the soil, especially to a deficiency of lime, potash, and phosphoric acid; but it now occurs on fertile soil, both virgin and highly improved, in as destructive a form as was ever observed in the most impoverished district, and is now absent from certain poor sandy regions deficient in the elements necessary to the growth of vegetation."

Of more recent accounts we have the following from the Delaware "Farm and Home" (a journal of unquestioned reliability), of October 22, 1891, viz.:

If there should yet exist any doubt of the fallacy of the theory that peach yellows is due to soil poverty, the work of Dr. Erwin F. Smith, this season, should now dissipate that doubt. This is the third season during which practical tests have been carried on in Delaware and Maryland, and with forty acres under experiment, the results all indicate that the disease spreads rapidly, and is as deadly among trees that stand in the best and most fertile soils as among those in the most barren fields. The theory was originally based upon some chemical analyses of diseased peach branches, in which there appeared to be less lime, potash, and phosphoric acid, and hence it was reasoned that the application of mineral manures to the soil would obviate the trouble. Some experiments made with sickly, neglected trees seemed to confirm this view; but when more carefully planned and comprehensive analyses and experiments were undertaken, the results show beyond cavil that no uniform proportions of these substances can be found in diseased twigs, nor in healthy ones, and that the mineral fertilizers exert no influence upon the disease to prevent or control it. The analyses made at the Connecticut Experiment Station in 1884 show diseased twigs that contained about the same amount of lime, less potash, but more phosphoric acid than healthy twigs. Those made by A. E. Knorr, in 1888, show twigs that contained less lime but much more potash than healthy ones. Other analyses made in 1890 showed similar results, and the conclusion reached by the chemists was that the proportion of these substances is dependent rather upon the degree of maturity of the twigs, than upon their healthy or diseased condition. The experiments made with fertilizers in the orchards of the peninsula show that the disease has spread as rapidly where heavy applications of potash and phosphoric acid have been made, as where the trees have been untreated.

I inquired, by letter, of the most competent authorities throughout the States where the yellows has existed, to know if it would be safe to import trees from districts in States where the yellows is known to exist, even if away from infested localities, and also as to the danger of introducing the yellows on pits or cions. I received replies showing that the disease has been introduced into the State of Connecticut and has made its appearance in Hartford, Toland, Middlesex, New Haven, and Fairfield Counties, on trees produced from pits taken from peaches from infested districts of Maryland, Delaware, and New Jersey.

*Since the above report was made the yellows has spread, and also has appeared in many new districts, as is shown in the accompanying map.

Authorities, however, dispute the fact of pits germinating which have been taken from fruit affected by yellows, as the fruit ripens prematurely, and therefore the kernel is undeveloped; yet those instances prove the contrary. As to cions, all agree as to it being unsafe to import them, as the disease can be inoculated. Others, competent to judge, say that its transmission by cions and buds has been very plainly demonstrated. The universal opinion is that there is great danger of introducing the disease on trees from States where the yellows has appeared, and that trees may appear healthy and yet be diseased, as the yellows seems to lie dormant in the tree for a considerable time before it shows itself.

MR. LELONG then explained the districts affected in the East, and the increase of the disease since 1888, by a large map.

DISCUSSION ON PEACH YELLOWS.

MR. MOTHERAL: Mr. President, in view of the paper that has been read, the County Boards of Horticultural Commissioners had a meeting last night looking to this matter, and they have some resolutions they would like to read governing the action that this Convention ought to take in view of the danger that has been so emphatically pointed out by Mr. Lelong.

[The resolutions were read, pledging the members not to buy Eastern trees, and warning others as to the danger, etc.]

MR. BLOCK: I move the adoption of these resolutions.

MR. MOTHERAL: This is the gravest question, gentlemen, that perhaps has ever confronted an assemblage of fruit growers. I live in a section of this State that I am proud of. We have rich soil, irrigated lands, and fine orchards and vineyards. But, sir, we realize that poverty is staring us in the face if there is nothing done to prevent the introduction of peach yellows into this State. We realize the fact that our wealth of soil will amount to nothing unless we have the coöperation of every section of the State of California to help us keep this dreaded thing out of the State. Our orchards, as Mr. Lelong has pointed out, will all be gone inside of five years, unless something is done. We must awake and adopt stringent measures. It is understood now by all the societies that this disease called the yellows is the result of low forms of life, like yellow fever, smallpox, and all those kindred diseases. There are ten thousand ways, so say our microscopists, in which they can be transported, and will sometimes evade the vision of the most thorough microscopist. We cannot be too careful. Pear blight is propagated in the same way; we brought it from the State of New York, and we have it now, as a fixture, perhaps, in a large part of Northern California. This is not so bad because it does not spread so rapidly, but we do not covet it here, and the only way to keep it out is to refrain from importation. Consumption may lie in the veins of a man and wife for their natural lives, and they may die, perhaps, of some other disease; but the germs will come back to their children. It is so with trees, and we must wake up to the importance of preventing the dissemination of this dreaded pest. We must not import any of these trees into the country. I think the Board of Supervisors of every

county can destroy this stuff after it comes here, and if this Convention will only give us its moral support we can go home to our several counties and go before the various Boards of Supervisors and present to them what has been done here in good, solid form. I believe we could get them to take certain steps necessary to support us. We must do it, or we will become bankrupt in a few years.

MR. JOHNSTON: The only objection I have to the adoption of the resolutions is that they do not go far enough. I indorse every word, and hope they will be adopted by this Convention, and I also hope that the movers of those resolutions will make them strong. We have men, good and true men, in California who are in the nursery business. We have a right to protect those men, and it is our privilege to do so, and I hope you will make those resolutions bind us not only not to buy such trees, but not to deal with men who bring them here. [Applause.] There are sufficient trees raised by good and honest, honorable nurserymen in California to supply all the necessities of this State, and if there were not enough this year they will raise more next. The only way to get rid of this dreaded pest is to cease importing the trees and patronizing men who will purchase them in the East.

MR. BUCK: I agree with Senator Johnston in full, and I know you cannot make this resolution too strong to satisfy me, and we have as representative an audience of fruit growers from this State, probably, as was ever in one hall before, and I believe that the sentiment that is voiced by this Convention will have its weight all over the State. I agree with Mr. Johnston, and I would not buy a tree of a nurseryman who I thought imported a peach tree from the East. You are never sure of a tree that you get from the East. I certainly, from this time on, will not buy a tree from a nurseryman who I know imports it from the East. There is danger in the air, and we are warned in time. Let us profit by that, and if you are short of trees you can raise them yourself if you cannot buy them; it is not a great deal of work, and it does not take a long time to do it, and you can raise them about as cheap as a nurseryman can if you will only go at it right.

MR. SAUNDERS: I think there can be but one opinion in shutting out the importation of trees from the East. The only question is how to accomplish it. You say this is a large representative body, and when you take into consideration the extent of the districts where peaches are grown, it is not so thoroughly representative. The time is now at hand when the peach trees are coming from the East, and we have no general law on the subject by which we can stop the importation of them, and unless we take more stringent measures than have been proposed here, there will be so many imported before we have this general law that our orchards will be completely ruined. The only feasible way, it seems to me, is to issue some publication from the State Board of Horticulture, and spread it broadcast over the State. Perhaps, if the Boards of Supervisors should undertake to bar it out, like the quarantine regulations, it would involve them in some proceeding in law. It might interfere with the interstate commerce law. Let us go to work and create a sentiment against importations from the East, by spreading this broadcast over the State, so that it will make it unprofitable for any one. It has been suggested that a good plan would be for the State Board to get out circulars of warning and danger, and put them into the hands of the

local societies that are interested in this matter, and let them then distribute them over their respective districts.

MR. BLOCK: I would like to ask Mr. Saunders how you can take any more effective means than by spreading it all over the State through this Convention, so that every man, woman, and child can obtain that knowledge which is so essential to their interests.

MR. COMPTON: This gentleman speaks about scattering the intelligence broadcast that the peach yellows is liable to be introduced. I think that is just what Secretary Lelong is doing. He has sent to all the Boards of County Horticultural Commissioners this news, and if they have done their duty they have scattered them broadcast throughout the different counties of the State. I am heartily in accord with the sentiments expressed here to-day, and I think Mr. Lelong has done his part, and if the people will do their part I think it will be thoroughly understood.

MR. WHITE: I wish it to be understood that these resolutions, as I understand them, do not cover the whole ground. At San Francisco we have the door through which all varieties of foreign scales are being introduced into our orchards, and which have cost this State so many dollars and so much anxiety and trouble. It is known that in the South Sea Islands, Tahiti, and other places, there are diseases that may be imported into California, and I think the resolutions ought to cover not only the fruit raised east of the Rocky Mountains, but I think should exclude the fruit coming in at the Golden Gate. Personally, I have seen peach growing in the Sandwich Islands, and it was very greatly changed from what it is here. I do know that they have the white scale there sweeping all through their beautiful groves, and turning them sere and yellow, constantly causing them anxiety. Now, our nurserymen can send down to the Sandwich Islands and import any amount of peaches—they have peach trees for sale—and if we confine our resolutions to the Eastern States they will go there. I think the resolutions should cover the whole ground. I am in happy accord with everything said about this, and feel that this Convention should throw forth its influence, and I believe it will be felt all over the State.

MR. JOHNSTON: I would state to Mr. White that instead of importing trees we have to export. Let us do one thing at a time.

MR. MCGLINCY: We have no County Board that holds any meetings. Now, the question is, "How are we to get these circulars into the hands of individual orchardists?" I would like to ask if our county has been supplied.

MR. LELONG: I sent several thousand pamphlets to that county (Santa Clara); I sent some to various places there. The Farmers Union gave them to all that called, and I mailed a great many.

MR. MCGLINCY: What I want to get at is the best way to get this matter before the orchardists of California, so they can know the danger of buying nursery stock. I have received within the last few weeks two catalogues and two especially prepared postal cards. I regret that I have not those cards with me. I received a letter which contained statements that I dare not quote to you, but they are strongly emphatic and state that it is utterly impossible to grow a tree successfully that is imported from the region where the yellows prevails. Now, then, what are we going to do? We may sit here and resolve till doomsday and

have no effect, unless we have some machinery whereby we can place this matter in the hands of every single orchardist.

MR. LELONG: I will state that we issued twelve zincograph maps, fourteen by sixteen inches in size, and we have given them very wide circulation. We have also loaned to many papers the cuts that show how Delaware and Maryland orchards now look after having been destroyed by the yellows.

MR. MOTHERAL: When I go home I will put these resolutions and what we did in this Convention in every paper in the county, and then I am going to urge upon the other counties to appoint Horticultural Commissioners to take charge of this matter, and if those Commissioners who are here will go home and write this matter up for their papers, and see that it is published in every paper in the county, it will do a great deal of good.

MR. CLAFLIN: I think that we should resolve to pledge ourselves that we will not buy any such diseased trees, and that we pledge ourselves to discourage in every way possible the importation of those Eastern trees, and also that we will not patronize men who are engaged in importing those trees from the East.

MR. ROBINSON: It is an easy matter to have this knowledge disseminated. There is not one paper in San Joaquin but will publish anything that will be of interest to the fruit industry.

THE RESOLUTIONS AS AMENDED.

The resolutions having been amended to cover the objections made, were read once more, as follows:

Resolved, That it is the sense of this Convention that our fruit industry is in imminent danger from the introduction of a disease known as "The Yellows," and infesting many of the fruit-growing sections of the East.

Resolved, That in view of all known facts regarding the disease, it is of vital importance to the fruit interests of this State that no trees grafted or budded upon peach stocks grown outside of the State of California, nor any buds, cions, cuttings, or pits from such trees, be imported into this State from Eastern States, even though such trees are apparently free from disease.

Resolved, That we pledge ourselves not to buy any such trees, buds, etc., and that we will discourage, in every proper way, their importation, and also that we will not deal with those who, from this time on, are known to import such trees from the East.

Resolved, That we believe that the Boards of Supervisors of the several counties of the State should use all the authority vested in them to exclude all Eastern stock grown on peach roots, or, if introduced, to use all lawful means to have them immediately destroyed.

MR. BUCK: As there seems to be a very unanimous feeling, I will put the question.

Adopted without a dissenting vote.

REPORT OF COMMITTEE.

MR. AIKEN: Your committee appointed to consider and report action upon the annual address of the President, now make the following report:

To the Fruit Growers' State Convention:

Your committee appointed to consider and report action upon the annual address of the Vice-President of the State Board of Horticulture, and presiding officer of this Convention, make the following recommendations:

First—That the subject of the importation of trees from the East and foreign countries be referred to the legal advisory committee of the State Board of Horticulture, a standing committee heretofore appointed at a previous State Convention, with a request to

report to the State Board of Horticulture such legislative action as may be deemed advisable and necessary upon this and other subjects of interest to the horticulturists of this State, prior to the meeting of the next Legislature.

Second—That a special committee of three be appointed by the Chairman to prepare and present to this Convention a memorial to Congress to prohibit, by necessary legislation, the adulteration of food products in this country, and the importation of such products from foreign countries, and also a memorial to the honorable Secretary of Agriculture, to recommend the obtaining and dissemination of information as to the quantity and quality of products of the soil in foreign countries.

Third—That a standing committee of five, to be known as the Columbian World's Fair Committee, be appointed by the Chairman, with power to act as an advisory committee to the World's Fair State Commission, in matters relating to the exhibition of horticultural products of the State, and especially the adoption of a national scale for judging citrus fruits.

Fourth—That this Convention adopt a resolution in favor of the reissue of a condensed report of the proceedings of the State Board of Horticulture and State Fruit Growers' Conventions, from 1885 to the present time.

Your committee desire to commend the address of the presiding officer of this Convention as a clear and concise statement of subjects of interest to the fruit growers of the State.

R. B. BLOWERS,
W. H. AIKEN,
FRANK A. KIMBALL,
Committee.

MARYSVILLE, November 18, 1891.

MR. BLOCK: I move that the report be received and adopted.

MR. AIKEN: The resolution heretofore presented and adopted shows very clearly the moral support that legislation will receive upon this subject. The State Board of Horticulture and the several county committees will act promptly and ably under the authority now provided by law. But we all know that the laws of the State were not formed to meet exactly this case. Here is a proposition to prohibit the importation of trees into the State for certain reasons. The legal aspect of this subject should be referred to the legal advisory committee, made up of three lawyers of this State, to give this matter careful consideration and prepare a bill and submit it to the State Board of Horticulture, and present it to the Legislature of 1893. I think the moral support it will receive, through your efforts, in the Legislature, will result in the passing of a bill that will at once be effective, and will hereafter prohibit by law the importation of diseased trees into the State of California.

The report as read was adopted.

PEAR BLIGHT.

MR. MOTHERAL: I laid upon that table a live specimen from a pear tree, and if I am not grossly mistaken, that is a regular, orthodox Eastern blight. It was imported into this State from New York, and I will say to the gentlemen that I am as anxious to have that looked after as this other disease called the yellows. I think this Convention ought to take action upon it.

MR. CAMPTON: Mr. Motheral claims that this has been imported from the East. It may have been, but we have trees in our own county that never were imported from the East, that have the same disease.

MR. HUSSMANN: I beg to differ with the gentleman who spoke last. I have fought the pear blight all my life. I cannot recognize that as Eastern pear blight. The Eastern pear blight, wherever it strikes a tree, the limb or top of it dies and gets black; spots appear first, and then the bark bursts. Look at this limb and you will find it sound—no bark broken—and it has not the appearance of pear blight.

MR. GUILL: About four years ago the pear blight developed itself, according to the best information that we could get, in an orchard near Chico, and I understand the trees were imported from New York. They have been dying every year since.

MR. BUCK: It is time for adjournment, and I will state to you that to-morrow we will take up the question of transportation.

Adjourned.

TRANSACTIONS OF THE THIRD DAY.

THURSDAY, November 19, 1891.

Convention called to order at 9 o'clock A. M.
Acting President Buck in the chair.

HORTICULTURAL PROGRESS.

By J. L. MOSHER, of San José.

Horticulture has become a science, and no one may expect to succeed without a proper study of it. The enormous increase of horticulture the past eight or ten years is phenomenal. This enormous growth is not extensively known, nor fully appreciated. It has become the leading industry of the State, rivaling all others in the general distribution of its benefits. What other industry could have raised the value of our lands from \$10 and \$100 to \$300 and \$1,000 per acre? What other industry could have increased the population of our State so rapidly? Its enormous railroad traffic has made it one of the prime factors showing the need of California having a competing railroad and an isthmus canal.

When I say horticulture is not fully appreciated, I refer to the earnest and inexhaustible effort necessary to secure from our Legislature a proper appropriation, and to keep it from being cut down or abolished. Also, we do not receive proper encouragement and premiums at our State and County Fairs. A prize for an exhibit ranges from nothing to \$2 50 and \$5; and, perhaps, a gigantic display costing a large outlay of time and money, might receive \$25; while a common horse race would command a purse of from \$300 to \$1,000. Outside of a great name, of what benefit have fast horses been to California compared to horticulture? Only those who are interested in horticulture can realize the responsibility of bringing a tree into the world, and training it up as it should grow.

We have before us here horticulturists old in experience, who have come from all parts of the State at their own expense and time to give their knowledge and advice—knowledge that has only been acquired by many failures, and at a cost of time, labor, and expense. They will tell you how differently we grow an orchard to-day compared to the past. How careful we must be in selecting our trees from the nursery; how particular to choose the right kind of roots for certain kinds of soil; the kind of trees for different climates; how far apart and how deep to set, and how to cultivate and prune, and general culture of the tree; all of which is of very great value to the beginner, and if you don't believe it, you will find it out.

In pruning I have learned that it pays to cut back well all new growth and to thin thoroughly. You will not get as much fruit, but it is fine and large, pays better, requiring less labor in handling, commands a

good price, and the trees are more thrifty. Fruit should be as ripe as can well be handled. Fine fruit is never a drug, and buyers will come to you for it.

The curing of fruit is a great study. Look at the advancement we have made in each and every year, and yet we have much to learn. Who among us here would not say: "If I were to set my orchard out again I would do this or that differently?"

Now, a word about the office of the State Board of Horticulture. Five years ago we had one small room, with a pocket account-book, and the then small appropriation was not all used. To-day we have several large rooms, immense ledgers and account-books, and we have to be very economical with our present appropriation. The perfection of this office is the Secretary's hobby. Here several people toil early and late; hundreds of letters, specimens and samples of fruits and fruit pests, parts of diseased trees and leaves, and various other objects of inquiry are received daily, as well as many people calling in person, all seeking information. It is well our Secretary is a horticultural encyclopedia, and he is kept as busy as the President of the United States.

We have many dangers before us. There is the yellows, that terrible scourge. Insects and other pests are constantly being imported. But are we not able to cope with all of these? Have we not overcome the ravages of the cottony cushion and pernicious scales that once threatened us with destruction?

I invite inspection from our State officials and others to what this State Board of Horticulture has done and is doing, that they may see its necessity and value to the State.

DISCUSSION ON PRUNING.

MR. MOTHERAL: Mr. Mosher, in his very excellent paper, stated that he cut back thoroughly. I would like to know what classes of trees he meant. In the country where we are raising prunes we dare not cut at all.

MR. BUCK: According to the discussions, and what has been told here in Conventions repeatedly before, there is a wide difference both in locality and in kind of tree. In some sections heavy pruning and heavy cutting back are required, while in others it is done to the injury of the tree. I think we know as much about it now as we ever will, for you can only get the knowledge by making observations in your section as to the kind of fruit trees that you have. Will Mr. Mosher answer that question?

MR. MOSHER: My experience is that we do not cut our peaches and apricots back enough, for the limbs bear down too much in consequence of not pruning them judiciously.

MR. MOTHERAL: What time do you prune?

MR. MOSHER: All times.

MR. MOTHERAL: Did you ever prune after you took the fruit off?

MR. MOSHER: A great many times.

MR. MOTHERAL: What has been your success at it?

MR. MOSHER: A good many think they have found it successful; a number of my neighbors think that it is the best way to prune—just as

soon as they take the fruit off the trees. In fact, our prune trees are allowed to grow up, and then the weight of the fruit bends the limbs right over, but if they are kept back one or two years they would get all of the fruit from the center of the tree, instead of having it on the limbs.

DISPOSITION OF FRUITS.

By DAVID LUBIN, of Sacramento.

A profitable return to the producer for his product is a chief aid towards the general prosperity of the commonwealth.

While a profitable return may be desired and sometimes obtained, yet in the greater number of cases the results are unfortunately far from profitable, nor are the causes for unprofitableness always, nor even generally, to be attributed to the producer's fault, but the main drawback rather consists in faulty methods for the disposition of the product. Various attempts have been made to remedy the method, notably that in the adoption of the auction system; but notwithstanding the perceptible progress made, there is yet much to be done before the maximum results aimed at be attained.

Chief among the causes for the fluctuating results tending towards a minimum result to the producer is the hazardous character of the merchandise, which hazard increases in a geometrical ratio the farther the product originates from the consumer, thus inviting the cupidity for exorbitant profits on the part of commission merchants, dealers, and venders.

In the history of a given transaction in the sale of green fruits raised in California and consumed in an Eastern city, there are two radical phases in price, viz.: the minimum which the producer receives, and the maximum which the vender obtains; and the consumer pays the man in the middle, the commission merchant, however, generally coming out at the large end of the "horn" by reason of his ample profits, and this ample profit is what pinches the producer, and just as long as the commission merchant is to be the factor, just so long will he persist in big profits, and just so long will the producer remain entirely at the mercy of adverse circumstances beyond his control.

A radical change of method is to be sought for, a method that will remove the cause of adverse conditions, and at the same time be the means for the placing of the maximum price in the hands of the producer, and this method is none other than that the producer dispense with all middle men and sell his fruits direct to the consumer, and to the consumer only, in quantities down to a pound at a time, and this can be done; nor is it necessary that each producer do this personally, but through his own wage-receiving employes.

To illustrate, an organization is formed in Sacramento or Placer County among fruit growers, whose products are consumed, say in New York. They hire a manager and empower him to go to New York and employ, say fifty or one hundred venders at a fixed rate per day, conditioned that these men have some means for carrying a few boxes of fruit, and on leaving a deposit for its full value. These men, when found competent, could be dressed in white overalls and jumpers and a white cap, or in some other inexpensive but effective uniform, and the words, "Em-

ployed by the Placer County Fruit Growers of California," painted on the jumper front; each to be provided with an accurate scale, and a large sign reading: "Placer County fruit, direct from California, 15 cents per pound," and a notice that the vender is to give accurate weight, and complaints to be lodged with the manager, whose name, street, and number is given, and with the qualifications of strong lungs, plenty of muscle, and a knowledge of the streets in the district to which he is assigned, the man is ready.

With every pound of fruit he sells he can distribute Placer County or Sacramento County "literature," and in a short time these hired venders will become an "institution."

The commission merchant, of course, will not take kindly to this, but the man's muscle and his vender's license will be ample protection.

Many, no doubt, will hastily conclude that this method is proposed as a joke, but let those analyze the various factors touching the disposition of green fruits, and they will find that the ultimate factor in the present mode of disposition is the vender, and it is proposed herein to make him the only factor, and that in the form of an employe only. This method will give the producer the chief desideratum in the form of the maximum price, and he will be able then, and only then, to fix and receive his own price for his product, and receive it direct from the consumer. Not alone can this mode be adopted for the disposition of green fruits, but dried fruits and even vegetables can be sold thus; nor need this method for distribution be confined to the Eastern cities only, but it may be employed with dried fruits in such cities in Europe likely to demand them—notably among them London; and as to General Chipman's proposition before the State Board of Trade, that of establishing a permanent agency in London, no better test can be given that market than the one under consideration.

It may be said that the antagonism of the commission men or the venders who buy from auction would tend to lower the price beyond a profit, but such can only be the case when the product is sold at wholesale; but when sold at retail, direct to the consumer, no attention need be paid to any counter efforts other than to fix the retail price according to demand, considering the quantity on hand, and the time in which it is to be disposed of, and cost for wages of venders.

Grading and fixing prices can be done jointly by the Eastern manager and the Association Directors, using the telegraph for that purpose; and the lower grades can be offered at a lower price in the poorer districts of the city.

The chief factor for success in the adoption of this method is in the selection of a competent and trustworthy manager for the East, but it ought not to be an impossible task to find such a one whenever there is an earnest effort to do so. And in order that no loss may be sustained through the possible dishonesty of the manager, an arrangement could be entered into between the association and a reputable banking house whereby the shipments are consigned to the bank, and the bank appoint a clerk as receiver of all moneys direct from each vender; thereby the manager would not handle any money received at all.

Accurate accounts could be kept in a simple manner, rendering a daily report slip from each vender, properly countersigned and balanced, showing quantity sold and amount realized, and forwarded to

each shipper. In addition, a daily statement of balances could be sent to the Directors by the manager.

A much misunderstood and a much abused term is that commonly known as "market." Who and what is the market? Can any one tell? Analyze your experience and you will find that (as far as fruit products are concerned) a combination takes place among the commission men, and at once the "market" is depressed; or, an understanding among the venders at the auction-room, and the "market" is glutted, notwithstanding, however, the retail price may be 5 cents each for a three-ounce peach, or 15 cents per pound for grapes that were originally bought for 2 or 2½ cents per pound.

The "Rural Press" of November 14th, in a portion of an editorial headed "Coöperation in Fruit Handling," and which was intended as a recapitulation of the objective subjects for discussion at this Convention, makes the following statements:

"Whatever the kind of action required, the underlying principle is the same, and that is, protection of the fruit product from the combines or whims of traders, and from the accidents which beset trading by those who have only a merchant's interest in the product. Certainly it can be held to be demonstrated that the growers have it in themselves to inaugurate new and broad movements, and to lift their interest clear above the ruts when it is found that these ruts are cutting too deeply into the highway toward prosperity."

It would seem, therefore, that the method herein outlined comes within the scope of your consideration.

In conclusion, permit me to state that while the method proposed may seem new and experimental, yet when carefully looked into we will find no absolutely new phase of fruit disposition advocated here, excepting only the one feature that the vender be in the employ of the producer at fixed wages, and that the vender sell only at the price fixed by the producer to the consumer, and that he return all such proceeds to the producer or his manager.

As for the vender's ability in finding the consuming purchasers, that fact is here already and needs no elaboration, for who does not know that while green fruits originally are handled by commission men, yet ultimately, perhaps, 90 per cent of it is sold by the vender. By the present method in vogue both commission merchant and venders are speculators; by the method proposed the commission merchant would no longer be required, and the vender would be an employé.

Would not the expense and risk be great in this method?

Well, considering that the producer would be his own speculator, and that his returns would be the highest retail, in place of the lowest wholesale price, there is ample margin for all risks and expenses, and in addition the highest possible return, besides the vexations and oftentimes great loss to crop in the attempt to find a buyer or a market would be overcome.

Dried fruits sold in this way would find many ten thousand more purchasers than now, for the good housewife, who may not otherwise think of providing herself with dried fruit, on hearing the cry, "Fine dried California peaches, 8 cents a half pound," would be tempted to buy right there and then.

The poor and densely populated districts of a city, especially, would, by this method, become purchasers of our products to a much greater

extent than by any other. Nor need the producer confine himself to disposing of his green and dried fruits direct to the consumer, but canned fruits can be disposed of with equal advantage.

Whoever has attended assemblies like this Convention, or popular gatherings among producers, or has perused current agricultural journals, will remark the oft-recurring generalizations relative to the detrimental influences of the middle man in curtailing the legitimate return to the producer. Hopeful anticipations are indulged in, tending towards a desire to be rid of a factor deemed destructive. Indeed, practical attempts have been made in that direction with varying results, but, as a general rule, the attempts have proved failures, and the producer, who shortly before thought he had found a key to utopia in dispensing with the middle man, found out by costly experience that his utopia was a delusion, and returned sorrowfully to the old time method, and again the middle man became the ruler of his destiny.

So complete was the defeat that the cause was not even looked into with that degree of research as to identify and verify certain commercial laws, the knowledge of which would mark axiomatic progress; and as a result current notions prevail and are repeated parrot fashion by the interested thinking, and by the disheartened unthinking element, that "a man cannot be a producer and a merchant at the same time."

Well directed experiment, based upon a correct knowledge of commercial law, however, may in time indicate the unsoundness of that statement, at least as far as green and dried fruit production and distribution are concerned.

At the present stage of experience it would be safe to state that such products as grain, hops, or wool cannot be sold to the consumer direct, and a middle man, perforce, must step in at some stage before the bread, beer, or blanket reaches the consumer; but with dried and green fruits the case is quite different, and if it is at all possible in our time to dispense with the middle man, it is in a product that may go right from the field of the producer to the table of the consumer without any other transformation than cooking, and in the case of green fruits it is ready, awaiting only the means and appetite of the consumer.

Here there are no barriers other than conventional usage of trade, and while the prime experiments in this direction may not at the start bring about that measure of success that later and more matured experiences may, yet it is a step towards the desired wish for the highest possibility, which, even by its failure, would tend to bring truth nearer at command.

Assuming, then, that green and dried fruits could be disposed of by the producer direct to the consumer, would it be safe to attempt it on a large scale at the start?

Obviously no; for there are lessons to learn that must necessarily involve waste of energy and means in the learning, and it will be time enough to involve much when there will be a surer certainty of positive gain.

Any enterprising county organization can enter the field as a start, and even if they do not meet with complete success at first, they will more than make up for any loss by the advertising the novel character of their enterprise will bring them in the East.

Should success crown their efforts, however, then indeed will their experiment prove of value, not alone to themselves, but to the commonwealth.

DISCUSSION ON THE DISPOSITION OF FRUITS.

MR. MOTHERAL: It seems to me that that is the only solution of this great and important question, and we ought to try and adopt it in all of the counties of the State.

MR. WALTON: I would like to ask Mr. Lubin how he would protect the grower in the return of the money.

MR. LUBIN: I would like to state, Mr. Walton, it is the simplest proposition imaginable. It is in operation in almost every business house, and that is, you can consign to your attorney or to your bank, and have the clerk of the bank appointed receiver.

MR. HUSSMANN: I am heartily in sympathy with this movement, and, although I do not grow fruit, I can cite a little experience of my own in the disposition of wine, which is somewhat analogous. The wine product of the State has mostly been handled by a few San Francisco dealers, middle men, and commission men. Last spring we had a fine lot of wines, and the only offer we could get was $12\frac{1}{2}$ cents per gallon in bulk, and the man who offered it to me told me he gave me $2\frac{3}{4}$ cents more than anybody else. I got excited, and I thought to myself, is all my trouble and all my care that I have taken going for nothing, and my fine wines to do no better than those of anybody else? I had a thousand gallons, of which half was slush, and I started out on a trip and tried to dispose of it myself. I went over to Oregon and Washington, and spent three weeks, and although my sales were not very large, the same wine for which I was offered $12\frac{1}{2}$ cents I got 40 cents. Those who saw my wine told me it was the best and cheapest that had been offered in the market, and they had to pay dealers more for an inferior wine than it cost them directly. Now, there is an instance of dealing directly with the consumer.

MR. MOTHERAL: I move that a committee of five be appointed by the President to proceed in the best way to put into execution the ideas embraced in the paper of Mr. Lubin.

Adopted.

COMMITTEE.

President Buck appointed on said committee, N. W. Motheral, of Hanford; P. W. Butler, of Penryn; D. Lubin, of Sacramento; John Markley, of Geyserville, and G. M. Gray, of Chico.

MARKETING CALIFORNIA'S FRUIT CROP.

By B. N. ROWLEY, of San Francisco.

All present will readily recognize in the subject selected for this essay one embracing so many vital points, that to carefully consider them in detail would occupy the time of the entire session to the exclusion of other important matters; I will, therefore, endeavor to be as brief and explicit as possible in developing the more important points for discussion.

For the sake of convenience, we will deal with the subject-matter under the following classifications:

First—Fruit for Eastern shipment.

Second—Fruit for canners' use.

Third—Fruit for drying.

Fourth—Fruit for local markets.

The growing of fruit for market can now be properly classed as a horticultural art, having long since outgrown the term business. In California we recognize the natural fruit orchard of the American continent, with climate and soil almost perfect. These favorable conditions have been taken advantage of by thousands of industrious, intelligent tillers of the soil, and to-day California stands comparatively ahead of all competitors as an all-around fruit-producing country. Each season witnesses the planting of thousands of acres to trees and vines. The quantity of fruit that can and will be produced within the borders of this great State within the next decade cannot be easily estimated by statisticians of the present day, and can only be approximately appreciated by those actively engaged in the nursery and fruit-shipping business. Fruit growers in the States east of the Rockies are fully alive to the competition from California's fruits, and are to-day industriously, energetically, and systematically working to meet it in the markets of the East and West, "fruit for fruit, and quality for quality."

We quote from an Eastern journal published in an extensive fruit-growing district: "It is an undisputable fact that large quantities of California fruits are annually disposed of in all the principal markets of the States east of the Rocky Mountains, and at much better prices than it is possible to obtain for the great majority of home-grown fruit. What can local growers do? Produce fine specimens by better cultivation and thinning, and put them on the market in more attractive form. Such a course will help Eastern fruit men to hold their own in a degree; but the fact must be recognized that any section of country with peculiar adaptation for any product can in time gain the ascendancy over all others. The remedy lies in the hands of growers, and if they desire to have their fruit recognized as equal to California fruit, they must make it so attractive in style and honest in quality that the buyer or consumer will not make invidious comparisons when it is placed by the side of California fruit."

These are broad but honest admissions made by leading dealers and handlers of fruit in large Eastern cities. The fruit growers of California occupy, from a fruit grower's standpoint, a most enviable position. Continue to cultivate your orchard in the future, as in the past—in a most thorough manner. Continue to thin, but more thoroughly in the future than in the past. The merchant's motto—"Goods well bought are half sold"—applies to the fruit trade. "Fruits well grown are half sold."

Use judgment in picking, and do not pull the fruit too green. Select only the largest, finest specimens, which should be wrapped and packed in bright, new packages of uniform size. Now, you are in a position to engage in a profitable fruit-shipping business. A profitable business is not of necessity a successful business. While it is a recognized fact that men engaged in trade endeavor to make a profit upon their wares, such profits should not be at the sacrifice of the future of the industry. Present profits are oft-times very much reduced, or even lost sight of altogether, for the purpose of securing the trade of certain localities.

TRANSPORTATION AND FREIGHT CHARGES.

This portion of the business brings fruit growers and shippers face to face with a problem hard to solve. As the matter stands at present, you are permitted to ship your fruit to the East. I say permitted, because carefully prepared statistics go to prove that growers and shippers are completely at the mercy of transportation companies. By hard knocks and experience, obtained at high cost, methods of shipping have been reduced to a science. At present, you have very little use for the expensive passenger train service, except for early, high-priced fruit, the refrigerator car on freight trains having largely superseded the special expedited service.

The saying, "It is the unexpected that happens," applies to freight rates on fresh fruits for the season of 1891. Growers and shippers naturally expected a reduction in freight rates in conformity with the size of the fruit crop and prices obtainable in the East; but, in the place of a reduction in a year of large crops, which means heavy shipments and low prices, the railway companies saw fit to increase the rate quite materially by making the rate to Denver, Kansas City, Omaha, and Missouri River points the same as to Chicago the year before, and, in addition, increased the minimum quantity for a carload in refrigerator cars from twenty thousand to twenty-four thousand pounds. This increase placed the freight rate at \$300 per car, to which add \$125 for refrigerator service, making the rate \$425 per car to Minneapolis and Chicago and all westerly points, including St. Louis and New Orleans; to New York, Buffalo, and Philadelphia, including refrigerator charges, \$535; to Boston, \$549 40 per carload, freight train service. Should passenger service or expedited trains be used the charge would be considerably increased.

We will take as a basis of calculation one thousand twenty-pound packages of fruit, allowing four pounds for the package, to load a refrigerator car of twenty-four thousand pounds, and five hundred forty-pound packages of fruit, allowing eight pounds for the package. By a little calculation we find that on the basis of Sacramento, allowing 14 cents per pound as the cost of the fruit, each twenty-pound package must sell in Chicago and common points for 95 cents in order to net the shipper 2 cents per package, and each forty-pound package must sell for \$1 95 to net the shipper 3 cents per package; hence, it is that California fruit must sell in Chicago and common points at 5 cents per pound to cover expenses.

If California growers and shippers expect to realize a profit on their Eastern fruit shipments, expenses must be cut down considerably. The growers and shippers should have credit for conducting their business on as economical a basis as possible; hence, transportation seems to be the only point that can be attacked for a reduction of expenses. Year by year auction charges, commissions, and other expenses have been materially reduced; but freight rates are increasing in place of decreasing, as they naturally should with the growth of the industry. Shippers are well acquainted with the history of the wretched service rendered last season by roads east of Ogden, the losses caused by delayed shipments, and the claims that were presented to the transportation companies, many of which have been allowed.

Had it not been for the failure of the Eastern crop and the fancy

prices obtained for California fruits, shippers during the season of 1890 would have met a "Waterloo" from which they never would have recovered. This year, with an abundant fruit crop East and a large crop in California and low prices prevailing, shippers have sustained serious losses, which, under present conditions, they can only expect to recoup in an off year with high prices.

The overland shipments of fresh fruit from California for the season of 1890 amounted to 3,732 carloads of ten tons each; for the season of 1891, to November 14th, 3,804 carloads of ten tons each.

For the purpose of comparing shippers' net returns with the amount paid the railroad companies, I have secured, through the kindness of Mr. L. W. Buck, Manager of the California Fruit Union, the footings of numerous account sales, taken at random from this year's business, with the following results: Gross sales, \$209,663 20; freight, \$109,191 90; net returns to shippers, \$88,743 40.

By this showing, which is considered by Manager Buck a fair average of this year's business, you will notice that the transportation companies received, in freights, more than one half of the gross sales and the round sum of \$20,450 in excess of what the shippers received.

FRUIT FOR CANNERS' USE.

The fruit canneries of California furnish a natural home market for enormous quantities of fresh fruit. For canning purposes sound, ripe fruit of uniform size is demanded. If permitted to select this class of fruit, canners can afford to pay better prices than for an entire orchard. Cannery sales are more profitable at the same price per pound than sales for Eastern shipments. Fruit allowed to remain on the trees a reasonable length of time after turning in color increases materially in size and weight. Canners require ripe fruit, while for Eastern shipment, fruit a trifle green stands the journey best. Selling fruit to canners is simply one of the many business transactions that fruit growers engage in. From the nature of things each party endeavors to drive as shrewd a bargain as possible, the producer on the one hand and the manufacturer on the other. Your interests are in a great measure identical, the one dependent upon the other. The fruit grower, however, is the more independent factor of the two. He has open to him several avenues through which he can market his crop, while without the fruit grower the canner would be out of business.

The annual pack of canned fruits in California amounts to about 1,200,000 cases of two dozen cans each. For this are required 54,000,000 pounds, or 2,700 carloads, of fresh fruit. Allowing the average price to be 1½ cents per pound, our fruit growers derive the very handsome revenue of \$810,000 annually from this source. The canneries furnish a spot cash market, for which fancy packing and packages are not required. A very small proportion of the gross receipts have to be paid to transportation companies; hence, the sale of fresh fruit to our canneries should be reasonably profitable. Individual growers have their business differences with canners, furnishing just grounds for complaint. It could not well be otherwise, owing to the nature and number of the transactions, and the large amount of money and fruit involved. Do not be too exacting and restrict your markets; you need more outlets and a much wider distribution for the increasing products of your orchards.

FRUIT FOR DRYING.

Fruit drying is now one of our recognized industries. That judgment, experience, and money are required in this branch of the fruit business in California goes without saying. The dried fruit markets of the United States furnish the greatest and most available outlet for the vast output of dried fruit, which is increasing in volume year by year.

The markets of the South Pacific Islands and Australia have been partially developed and are taking fair quantities of dried fruit this season. Our dried fruits are also being gradually introduced into the various large cities of Europe, several trial shipments, consisting of carloads of choice apricots and peaches, having been distributed in the Old World at good prices. A very large, profitable trade will certainly result from the proper introduction of California dried fruits into England. The output of dried fruit in this State from the crop of 1890 was 48,700,000 pounds, or 2,435 carloads, classified as follows:

Apples.....	1,000,000 pounds.	Prunes.....	14,000,000 pounds.
Apricots.....	8,500,000 pounds.	Grapes.....	10,500,000 pounds.
Peaches.....	12,250,000 pounds.	Nectarines.....	500,000 pounds.
Pears.....	600,000 pounds.	Figs.....	350,000 pounds.
Plums.....	1,000,000 pounds.		

On a basis of six and one half pounds (which is a liberal allowance) of fresh fruit to one of dried, exclusive of prunes and grapes, which require three and four pounds, respectively, we find that the quantity of fresh fruit used amounted to 241,300,000 pounds, or 12,065 carloads. If that quantity of fruit had been shipped East in the fresh state, the transportation charges, say nothing of other expenses, would have amounted to \$5,127,625, as against \$730,500, the cost of shipping 2,435 carloads of dried fruit at \$300 per car, or 1½ cents per pound. This shows a saving to growers and shippers of \$4,397,125 on one item—dried fruit.

The fruit drier's best market should be at home for cash. The price for your dried product should be made in California, and not in the East. We are obliged to recognize certain Eastern and foreign competition, which must be met; but the basis of calculation should be established in California, where the goods are produced and manufactured. This can best be accomplished by concert of action on the part of large growers and driers in the various producing centers. What class of successful manufacturers do you find year after year placing their products upon the open market without a fixed value, permitting the purchasing public to dictate the price? The selling price of all manufactured articles should be based upon the cost or value of the raw material, added to the cost of manufacturing. The outlet furnished through the medium of the dried fruit market is a most valuable one, owing to the remoteness of California from the large markets of the country. The professional drier should be given some thought and encouragement. Growers must recognize the fact that the price of green fruit naturally regulates the output and price of the dried product. Low prices for green fruit induce a great number of professional driers to enter the field, who purchase large quantities of fruit for cash. The necessary expense of curing and preparing for market further adds to the already heavy outlay. Men engaged in this business require a large capital or good bank credit, and have but one object in view—that of making money. They are, as a rule, sharp and shrewd, and, while practicing economy in all branches

of the business, are alive to the fact that the best prepared and finest looking fruit brings the highest price. They are compelled to open the market by making a price for their dried product, based upon the cost of the raw material, curing and expected profit added. The market once opened and prices made, they have to be sustained, in order to avoid serious loss. In order to sustain the market, the professional driers and speculators call to their assistance the ablest of our commission men and brokers, all of whom are in close touch with the heavy trade in the East.

Frequently it occurs that the market sags and prices weaken. In place of rushing their fruit forward and pushing sales by cutting prices, they immediately withdraw temporarily from the market as sellers and become buyers. The natural result of such a movement is to strengthen the market and advance prices. The moment they succeed in disposing of a reasonable quantity of their dried product to Eastern dealers the pace is set and the traveling comparatively easy, as, by the last move, they have brought to their assistance the large distributors throughout the United States, who are equally interested with the manufacturers in making a profit on their purchases.

The high price demanded for green fruit at the opening of this season prohibited very many of our professional driers from entering the field; hence, this year's crop was largely cured by individual growers. There is a vast difference between what the trade terms a growers' market and a dealers' market. The fruit once sold and in the hands of dealers and speculators, the market becomes steady; quotations represent values which are obtainable, if not so high as to restrict consumption. When dealers have their money behind the market it is pretty sure to remain firm.

On the other hand, with the dried fruit in the hands of individual growers, scattered throughout the country, with each grower as well as locality making a different price, the market necessarily exhibits a state of weakness and uncertainty not inviting to cash buyers. Oftentimes growers' necessities place them at a disadvantage, compelling them to part with their fruit at a most critical time, when they should hold in place of selling, in order to sustain the market. Free offerings on a weak market naturally cause prices to decline. In a measure these conditions account for the low prices on dried fruits this season.

FRUIT FOR LOCAL MARKETS.

The local market being the easiest of access, should be cultivated and extended. San Francisco, the largest natural local market of the State, should be one of the best markets for choice fruit in place of a dumping ground for the culls and refuse of the entire fruit crop. A very limited quantity of fine fruit reaches San Francisco, and visiting strangers are quick to notice this and other peculiar conditions of the home market. A city of three hundred and fifty thousand inhabitants, situated in the very center of a fruit-growing State like California, should certainly possess a fine public market and a large display of choice fruit. One of the greatest advertisements the State and her fruit industry could possibly have would be a well conducted public fruit market in San Francisco.

The retail price of fruit in San Francisco seldom, if ever, changes or

is affected in the least by the size of the crop or the price received by the growers. The retail price of fruit remains "three pounds of apricots for 25 cents."

Fruit, as a rule the cheapest article of food upon which the public can be fed, is notably conspicuous by its absence upon hotel tables. What member of this Convention has not noticed with supreme disgust the miserable quality of fruit generally placed before the guests? In Los Angeles and Riverside, the home of the orange, it is quite difficult to secure even an edible specimen from a hotel table.

At present, the fruit disposed of through the San Francisco market is handled by so-called commission merchants. With a few honorable exceptions, the handlers of fruit in San Francisco are a class of ignorant foreigners, a detriment to the trade and a libel on the honorable commission business. Fruit growers should devise some means whereby this class would be obliged to step down and out and rustle around for trade, in place of sitting upon a pile of boxes at their door waiting for some poor, unfortunate "Dago" or Chinaman to drop in and buy a box of fruit. It might be barely possible that a properly conducted fruit auction in San Francisco would, in part at least, remedy the existing evils.

DISCUSSION ON MARKETING CALIFORNIA FRUIT.

MR. BLOCK: This is to us a very important document, and will require much time to discuss it. Take those shipments: out of \$209,000 received gross, the railroad company got \$109,000, and the producer got out of \$209,000 gross, \$88,000. I have no doubt my friend has given a correct statement as far as he got it from the books, but it shows a great discrepancy, and yet it does not show it all. Out of \$88,000 that the producer got, a very large proportion had been paid out for boxes, paper, packing, and loading, and other incidental expenses. I do not think that Mr. Rowley has examined this matter so that he could give us the figures, but I venture to say that the amount realized is not over \$60,000. I think I am right, and I venture the assertion that he paid out \$8,000 for boxes and incidental expenses. Now, this is a serious matter to some of us growers. I suggest that a committee be appointed to whom this able paper may be referred, with the view of submitting some proposition to this Convention, if possible, to adopt ways and means by which that part of it can be remedied. It seems to me the railroad ought to make a reduction of one half of the gross sales. Two years ago I was at the California Fruit Convention; I urged the proposition that the railroad should carry the fruit at one half, but I was laughed at. I think the railroad should take it at one half instead of two thirds, as it is in the East. I have not digested this paper; it is a very important one. I move that this matter be so referred.

MR. ROWLEY: There is a matter in hand that this Convention will have an opportunity to remedy—the transportation evil—if it can be remedied; but whether it is the proper time now to present that matter, I am not posted.

MR. BUCK: Perhaps that will cover the same ground.

MR. BLOCK: If that is the case, I propose that the motion lay over.

MR. BUCK: The figures that Mr. Rowley has are simply taken here

and there out of quite a large number of statements of shippers. I think they are nearly correct.

MR. PORTER: In the matter of transportation and the ideas suggested, I have listened with great pleasure to the gentlemen who have preceded me, but I do not think that I have heard any ideas advanced that are adequate to the occasion of merchandising. I think there is one simple remedy for this matter, and that is, there is a railroad running across this continent that the people have furnished more than the cost. It goes from here at least to the Missouri River, or in that vicinity. We are informed that the owners of that road are laboring under a great disadvantage to make their money in it pay interest. It is rather a foggy proposition. They owe some bonds to the people of the United States, and they have allowed other bonds to precede the payment of them. I have, at earlier periods of my life, thought it would be a danger for a republican government to undertake to own its own modes of transportation, but since I have seen how successful we have been in some matters, to wit, the Post Office Department, and have read the late report of our able Postmaster-General, that no private corporation could conduct the business as cheaply as the Government, it has dispelled from my mind the idea which I once had, and I now believe it to be a wise and just proposition for the people of the United States to collect what is due them and discharge their own obligations, and take this little stretch of road that the people are laboring for so assiduously, and run it on the basis of cost. [Applause.] I do not see how you people are ever going to get away with these little troublesome questions. I do not see where we are going to stand in this business with little temporizing remedies. It is, in my opinion, a worthless outlay of time, and certainly humiliating in the last degree to go around and beg for something which rightfully belongs to you. [Applause.] I think a respectable body of this kind, and an interest of this magnitude, could certainly make its voice heard, if it were done in a proper manner, and that we go to work at this question and begin business on first principles, not the seventh, eighth, tenth, or fifteenth. The gentleman who preceded me took a brief diagnosis, or bird's-eye view, of the paper here, and as things stand, I move an amendment: "That when this matter is referred to this committee they take that fact into consideration with the other."

MR. BUCK: I do not understand the purport of your amendment.

MR. PORTER: I move that the question here under consideration be amended by adding that "when they take into consideration the question of transportation of the fruit of this coast, that they consider the question, the interest that you and I and all of us have in this matter, and consider it with the other, and see what steps, if any, can be reached in that way."

MR. BUCK: There cannot be an amendment until there is an original motion made. The original motion was made by Mr. Block and withdrawn for the time being; consequently, there is no motion in regard to that. Mr. Rowley stated that there was another matter that would probably come up here, and perhaps that would explain and afford some further information in regard to this, and so on the strength of that Mr. Block withdrew his motion.

MOTION.

MR. MOTHERAL: I desire to make a motion in relation to the paper read by Mr. Lubin. I move that this Convention appoint a committee of five to carry out the ideas embodied in that essay.

Carried.

RESOLUTION.

MR. MOTHERAL: I beg to offer a resolution sent here by the organization of County Commissioners, as follows:

Resolved, That it is the sense of this Convention that all pear trees grown in or outside of the State, in regions known to be afflicted with pear blight, be quarantined, and that no nursery stock shall be allowed to be shipped or sold from any district in the State where pear blight is known to exist.

MR. MOTHERAL, continuing: I move that the foregoing resolution be adopted.

Carried.

TRANSPORTATION OF FRUIT.

MR. MASLIN: I will detain this Convention but a few minutes; if I am out of order, the Chairman will call me to order. It is in reference to the transportation of fruit in this State, and a market for it. You have heard in this discussion some complaints about the extraordinary railroad charges for fruit transportation across the continent; but the people of the State of California have the remedy in their own hands by the means which Almighty God has provided, and that is the sea—the open sea—upon which there can be no monopoly. California is destined in time not to have one acre of land which will not be devoted to the raising of fruit. Thousands and thousands of acres will be devoted to dried fruits in the future, and, probably, the whole of the San Joaquin Valley. Now, we want a market for our dried fruits, and why we have not had it is something we have not been able to discover, except that all the people of the United States have had their tastes cultivated to green and fresh fruits. Look at that map from Maine across the northern line, excluding Montana, Idaho, and Wyoming, of which the people of all those States are capable of raising green fruits, while we have on the other side of the Atlantic fifty or sixty millions of people in England who are almost debarred from the use of green and dried fruits. There is a market for California in Continental Europe and in England. We have been corresponding with men there who have described the views of the people of England upon this very important subject, and a letter was received at the State Board of Trade yesterday from a gentleman who said that if he could place in England our dried fruits at the prices named to him, there would be a market in England for more than the State of California could produce. I am corresponding with a gentleman now at Hamburg, Germany, who left California about two months ago with the knowledge of the price at which dried fruits could be purchased here, and with a general knowledge of fruit quotations, and he tells me that California can find an offer for all of her dried fruits in Germany.

Now, it rests with us to solve this question. The State Board of Trade

in its endeavor to open up this new channel of commerce to the people of California, and open a market to them for their dried fruits, have proposed to them—not with a desire to make any money—to form a corporation composed of the fruit growers of the State of California. We desire to raise a fund of about \$10,000 in shares, one thousand shares at \$10 a share, in which every fruit grower who wishes can take a share of stock, not for the purpose of making money, but for the purpose of raising a fund to enable us to send an agent to England who may dispose of our dried fruits, and to sell them at a very low rate in order to cultivate the taste of the people for it. These tastes have to be cultivated. You have to educate the people to these tastes, and teach them how to use and cook it, and hence the necessity for an agent. We are sending all over this State circulars to every fruit grower requesting him to take stock to raise this fund, and to try and relieve California of her dried fruits, and thereby get a market for this most valuable industry.

BLACK-KNOT.

MR. MOTHERAL: There is another resolution I would like to present, in relation to the black-knot:

Resolved, That a disease known as the black-knot, on nursery stock and vines, is being scattered over this State. That it should receive the attention of this Convention, and be brought to the attention of the fruit growers, and such measures adopted as will check the disease.

MR. WICKSON: In relation to the reading of this resolution, I will state, that as far as it is concerned, I am heartily in favor of it, but when you go beyond the reading of it you are getting into deep water. If there is any relation between the old black-knot of the plum and cherry of the East, and the black-knot which we find on the roots of nursery stock and grapevines, we do not know it. It has not yet been demonstrated. The cause of the old black-knot of the plum is well understood. This fungus can be readily made out, by one accustomed to such investigation, with the aid of a microscope. Microscopic examinations of the abnormal growth on the roots of fruit trees show that grapevines do not contain such organisms as are found in the black-knot plum. Now, when you come to see the so-called black-knot at the root of the peach and other trees, and of grapevines, you will find a different state of affairs existing. Several of us have proceeded upon the theoretical grounds that the cause of that abnormal growth was a small worm. Examinations have not borne out that assumption in all cases. I have, for a number of years, been examining those knots without success, or without finding that worm.

MR. BLOCK: I have received trees from different parties that were affected with black-knot, and upon investigation I believe the cause of it was wet.

MR. HUSSMANN: I have just a little personal experience to relate in relation to the black-knot of the grapevine. I have always looked for the cause of black-knot either in too close pruning of grapevines, bringing about stagnation of the sap, or early injury to the root before it has fully developed. In 1886, May 13th I think it was, when the black frost struck our vineyards and killed all the buds and shoots on the vines, it

was followed by black-knot. So my theory is that it is due to the other cause—the stagnation of the sap or bursting of the sap vessels.

The resolution was adopted.

TRANSPORTATION—(Resumed).

Resolution offered by S. J. Stabler:

WHEREAS, An organization has been formed under the designation of the Traffic Association of California, with headquarters in San Francisco; and whereas, the objects of the association shall be for the purpose of regulating traffic, that the interests and resources of our State may be developed by overcoming, through united effort, discrimination, inequality, and excessive carriage charges; also, to foster our commercial interests and industries by developing new territory for our trade and opening new fields for our merchants and producers to distribute their goods, products, and manufactures; also, to enhance the commercial prosperity of the State of California by encouraging the building of canals, improvement of watercourses and rivers, competitive systems of railroads, steamship lines, and for such further purposes as may tend to develop the interests of our State; therefore, be it

Resolved by this meeting of fruit growers in Convention assembled, That we do hereby indorse the aims and objects of the Traffic Association of California, as herein set forth; further

Resolved, That each delegate of this Convention hereby pledges himself to use his utmost endeavors in his respective locality for the establishment of a County Traffic Association; further

Resolved, That said local Traffic Associations be formed for the purpose of coöperation with the Traffic Association of California, and to participate in the great work to be undertaken by said association.

MR. STABLER: I have given this subject considerable thought. There was a gentleman on this floor yesterday who said he thought that the most important question for us to consider was the exclusion of peach yellows, and who gave as a reason, that the yellows attacked the fruit in this State just as it did in New York, and that we would suffer great loss from the disease. Now, I take issue with him in some things, and agree entirely with him in others. I think the next important question for us to consider is that of transportation. If we can keep out the yellows and raise good fruit, and then cannot get a market, there will be no use in raising it. The Fruit Growers' Conventions of this State, as you will recollect, and so do I, have been for a number of years appointing committees to investigate the proposition of a Traffic Association of this State. The Southern Pacific Railroad Company is the most despotic monopoly in this State. We know that the Chamber of Commerce and the Board of Trade, and, in fact, every organization in the State of California, have been bowing obsequiously to that company for a number of years. Now, Mr. Chairman, I have no apology to make to the Southern Pacific Railroad Company for criticising their action. I believe there is no gentleman in this Convention called upon to apologize. As an old Californian I recollect, and so does every old Californian here remember, that four men started in here with a nominal capital of \$175,000; that after the first shovelful of dirt had been pitched they appealed to the Government for means to build a road, and they received a grant of land from the Government, the proceeds of which have run up into the millions; they had no other capital, and never received any other but the proceeds of this land; and therefore I say that the Government built this road, with the exception of that nominal capital. That the law of Congress, at the time of that grant to them, provided that all of the lands of the United States were liable to preëemption and

sale to settlers of the United States at \$1 25; but when that concession was made to this road by Congress, in the same breath and in the same law they doubled the price on the even sections, and when they sold them to the settlers they had to pay \$2 50 an acre for it. Therefore, I say in equity the people of the State of California built the road, with the exception of that nominal capital. Our friend, Judge Davis, will tell you the same thing; therefore, I have no apology to offer to them, and I feel, as an old citizen of the State of California, that I have a right, in common with you all, to criticise them in any manner that I choose.

Now, Mr. Chairman, under this title of transportation, the only solution of this question, and the only redress that we can have, is by a competing line of railroad running from the Eastern States to the tide waters of this State; and if the time is ever ripe for it, it is ripe for it now. Of course we want the Panama Canal, but at the best that is ten or twenty years off, and our present orchards will have run through their maturity and died before that time comes. There are three or four lines of railroads anxious and willing and ready to run a branch of their lines directly to San Francisco. The Atchison, Topeka, and Santa Fe has been extended to California, and has been endeavoring to get up into Central California for years. When they got to Los Angeles the Southern Pacific ran a line to parallel them, so they could come no farther. That policy has been pursued throughout the entire State; every precaution has been taken, and every projected road, except the Donahue, has been either suppressed by competition or bought off or paralleled. The Rio Grande, from Salt Lake, is willing to come here. We know that in Southern California five or six years ago it was duller, and more quiet, and less progressive than in any other part of the State; but immediately upon the advent of the Atchison road, they commenced to progress, and they have progressed wonderfully and marvelously, and now have acquired more of a population than any other part of the State within the last five years, and are now most progressive and happy. With the advent of these roads we have built a city in a few years, and it is now on the high road to progress, and it is one of the saddest conditions of affairs to see our central section of California more and more oppressed all the time, it being the most productive section in the State. Heretofore there has been no unanimity on the part of the people of the State. I have been surprised and delighted at the progress made by this California Traffic Association, so called. I also noticed a day or two ago that it has taken such form and made such progress that our neighboring States have joined it. It seems that the little State of Nevada, not having one tenth nor one fifteenth part of our material wealth or prosperity, has donated \$1,038,000 for a competing railroad. Now, while we have been lying idle and apathetic, as we have, this single corporation has been going ahead until it seems it is going to be the hardest kind of a fight. The fact is, they are all united, and are almost as powerful as the State is, and unless the Convention and every member of it will come forward and join this California Traffic Association, or something else, we will get poorer and more enslaved than ever. We all know that this is a very wealthy corporation, and the first members of the Southern Pacific Railroad were worth upwards of \$200,000,000, and one of its original members has founded an institution of learning with an endowment of \$20,000,000, and one or two of the members leave wealth of \$70,000,000,

and some have \$50,000,000. In fact, we know that the wealth of the original members of the Southern Pacific is fully \$200,000,000, equal to two thirds of the assessable property of San Francisco, or one sixth of the assessable property of the State. The assessable property of this State last year was a little less than \$1,100,000,000, making this one company owner of one fifth or one sixth. As a gentleman has well said here this morning, they are above the law. They say to the Government: "You hold the second mortgage on the road, and we will pay you this money in sixty years, with 2 per cent, and if you don't like that, what are you going to do about it?" They go to the collector at Sacramento and say: "Here is a check for a certain sum of money; it is all we owe; we keep our books, and we estimate what we owe, and if you don't take that, what are you going to do about it?" These things have been done, and you know they have been done. When a Judge in the city of San Francisco exercises a little more nerve than is common in summoning railroad men to appear, they leave the State and decline to go, and then say: "What are you going to do about it?" and there is a case now in the Supreme Court of this State. Now, as I said before, I have no apology to make to this company. I say this is the right time, if I am correctly informed, for every producer and shipper here to respond unanimously to this California Traffic Association, and let us do something. As was said this morning, more than one half went to this corporation, and when you go to them they have two answers, and that is all I ever had from them, and I will guarantee that is all anybody had from them. The first is that "the roads do not pay at a less rate," and the second is that "they are tied up with transcontinental railroads;" and when they, from \$140,000 and the grant from this State, have accumulated \$200,000,000, I take the liberty of denying those propositions. I think it does pay. Of course, we cannot have access to their books. I hope that you will take action, and I hope every man here—every fruit grower—will see the importance of this, and see by their apathy that they have lost ground. Come forward and take some definite action. I suggest that there be a committee appointed by this Convention to represent the fruit growers in a body in the Convention of the Traffic Association, and means be provided for them.

MR. ROWLEY: The objects of the Traffic Association of California have been given to the people through the public press, not for the purpose of antagonizing or making any particular fight against any particular line; but there is an organization in existence known as the Transcontinental Association. It is composed of twenty-six roads, each having a representative delegate, and which, on a question where the rate of freight or the percentage of the traffic is concerned, requires a unanimous vote to raise or lower the rate. It is against the Transcontinental Association that the movement is directed, and not against the railroads themselves. Any local Traffic Association may send one delegate, the cost of his membership not to exceed \$150.

MR. BENSON: I see the old feeling is just coming up again. I am really getting tired of it. I am an old Californian, coming here in 1848, and am personally acquainted with the promulgators of that road and the men who built it. Now, what assurance have we, if we spend our money in getting a competing line into the State, that it will not get into the Transcontinental Association—that they will not join hands with the

Southern Pacific? We have none. How much cheaper do the people of Southern California get their oranges to the East than they did under the old regime? The only way to solve this question, my friends, is the governmental ownership of railroads. It is not right, my friends, to place in the hands of a few men such great temptations, and it is decidedly contrary to either a democratic or republican government. Australia controls her railroads, and you can travel for half a cent a mile first class, and they make good profit. Mark my words, they will not fight one another, but they will grind the producer under their heel and extract the last cent from him, as you do the oil from an olive; they are going to get all they can out of it, and will regulate your prices.

MR. KIMBALL: Peach yellows affects only one product, but transportation affects every product. It is within the memory of every person here when the first carload of green fruit was sent East for \$1,250, and the railroad company said it was a loss to them. I was a member of the California State Grange in 1878; I prepared a set of resolutions in favor of subsidizing the Texas Railroad with money, or bonds instead of money; when that resolution passed, two hundred and thirty-four voted for it out of a membership of two hundred and thirty-eight. Governor Stanford sent for me to come to Fourth and Townsend Streets; I went there and saw Mr. Crocker, as Mr. Stanford was away. He asked me why I was offering opposition to the Southern Pacific and Central Pacific. I told him I did not see why I should not. I paid my own money and was under no obligations to him or anybody else. He said: "You will never live to see a carload of green fruit taken across the continent at a less price than \$1,000; that it did not pay expenses." I said: "I hoped I should live to see that very thing changed, and that you will, before long, take four carloads of fruit for \$1,000, instead of one." He said "that that was entirely impossible," of course. I finally told him I would work to that end. He said: "Any railroad coming into this State, we propose to build it." I only weighed ninety-two pounds then, and I was sitting about ten feet from him with my hat in my hand, and I said: "Mr. Crocker, that depends—" "It depends upon what, sir," said Mr. Crocker. "Which is the smartest man, you or I." I was pretty saucy for a little fellow, but he made me very angry. I stated "that before long you will see a road in here of which you will not own one spike."

MR. CLAYTON: I believe there is an arrangement between the Atchison and Southern Pacific, whereby the former keeps out of the fertile valleys. All other roads are kept out by subsidy. Not long ago I was a member of a Convention assembled at San José. We were trying to get a competing line, and I had occasion to meet the Atchison officials last winter. They were very noncommittal, but the officials told me that the Southern Pacific agreed to give the Atchison anything if they would not build into the fertile valleys of the north. I certainly favor the resolutions.

MR. BUCK: I am decidedly in favor of this organization in San Francisco, but there is one thing about it that I am a little suspicious of. It has been started late. There are some names in there that I do not like, while there are others that I do.

Motion carried.

MR. STABLER: I move that a committee of three be appointed to consider this matter.

Adopted.

COMMITTEE.

THE PRESIDENT: I will appoint on that committee S. J. Stabler, B. F. Walton, and W. H. Aiken.

AFTERNOON SESSION.

Convention called to order at 1:30 o'clock P. M.
President Buck in the chair.

APPOINTMENT OF COMMITTEES.

The President announced the following appointments:

On Resolutions.—Henry A. Brainard, of San José; Frank A. Kimball, of National City; A. P. Crane, of San Lorenzo.

On World's Fair.—J. E. Cutter, of Riverside; J. R. Dobbins, of San Gabriel; S. J. Stabler, of Yuba City; J. A. Clayton, of San José; Geo. Hussmann, of Napa.

On Memorials to Congress.—W. H. Aiken, of Wrights; B. F. Walton, of Marysville; C. H. Allen, of San José.

On Exhibit.—E. W. Maslin, of San Francisco; R. B. Blowers, of Woodland; Leonard Coates, of Napa.

SMYRNA FIGS.

By G. C. ROEDING, of Fresno.

It is now about ten years that the fig industry has been vigorously prosecuted by the orchardists in this State, their universal aim being to produce a fruit which would compare favorably with, if not equal, the world-renowned Smyrna fig of commerce, known as such for more than two thousand years, and described by the early authors of the ancient Greek era. Scientists of a later date have often attempted to discover the secrets surrounding the production of this fruit, but thus far none have succeeded in unraveling and explaining its mysteries for practical use. It has always been a puzzle to me how, in this long lapse of time, Smyrna has managed to maintain a monopoly of the fig business, as undoubtedly Italy, Spain, Portugal, and the southern portion of France must have equal facilities in soil and climate for the production of figs, but none of these countries, though growing numerous kinds of fig fruit, for food and for table use, have ever succeeded in producing a dried fig that can compete with Smyrna; and any one inquiring for first class dried fruit along the Mediterranean coast is always directed to Asia Minor, as the only place where it can be obtained in its well-known perfection.

Among those who have taken a lively interest in this country in the fig business I may say that the Fancher Creek Nursery has done a considerable share by importing and planting numerous varieties of cuttings

from Smyrna and other places, and it is only during the last two years that any practical results have followed its exertions. With the introduction of the White Adriatic variety it was thought the problem had been solved, and while it cannot be denied that this kind produces one of the finest of table fruits, it must at the same time be admitted that when dried it does not come up to the standard of the imported fig from Smyrna, lacking in its most essential points, viz.: tenderness of skin and flavor. The early conviction of this truth induced the proprietor of the above nursery to send his foreman, W. C. West, in the year 1886, to Smyrna, for the purpose of investigating the fig business on the spot, and to obtain a variety of cuttings, and all possible information for the successful prosecution of the business in this State. Mr. West remained in Smyrna four months, and, after considerable difficulty, succeeded in securing several thousand of the Smyrna fig cuttings, as well as quite a number of the wild figs and a few of such varieties as are grown for home consumption, some being used in the green state and others dried. Mr. West's trip and experiences will probably be of interest, and the following is a copy of his letter of November 6, 1886:

I am having no end of trouble. I find I have been watched by the people here since first landing; the parties from whom I first engaged cuttings have refused to let me have any at any price and I do not know what to do. I went to the American Consul for assistance; he informed me that I could only obtain the cuttings through a foreign resident, as the Smyrna people were very much opposed to sending cuttings of any kind out of the country for fear of competition. Seeing the utter uselessness of trying to secure the cuttings directly, I took out a hunting license, and with a passport which I had used on a former trip, I, with Mr. Hall, a gentleman who had resided a number of years in Smyrna, started for the interior, and was successful in getting cuttings from Erbeli (this is the valley where the finest figs are grown). I did not appear in the transaction at all, but was shooting in the orchard where the cuttings were being gathered, and kept watch of the Turks all the time, to see that they were cut from the right trees. From the valley I shipped them by the Aidin Railroad to Smyrna as licorice roots, the company refusing to take them unless consigned in this manner. On the arrival at their destination the packages were placed in the warehouse of the English Steamship Company, and there packed with sawdust in boxes lined with thick paper, and shipped on a steamer bound for London. With the assistance of Mr. Van Lennip I secured the wild fig cuttings, and also quite a number of other varieties.

After West's departure the following appeared in the "Oriental Advertiser," published in Constantinople, of December 18, 1886, from their Smyrna correspondent:

We often hear people exclaim "I don't care a fig," as if they considered a fig a very small matter. Our American cousins, however, look at it from a different, that is to say, from a commercial point of view. We always thought the fig growers of Asia Minor were jealous of any foreign competition, and we gave them credit for a certain amount of foresight and worldly wisdom; but we find that it requires but little of the gold dust of the New World to blind them to their own interests. The Americans have just succeeded in playing upon the dozing Smyrnaites a trick which will no doubt prove of serious consequence. Some three months ago Mr. W. C. West, of the Fancher Creek Nursery, Fresno, came to Smyrna to make a study of the Smyrna fig, and also secure cuttings of that variety for propagation in California. Fortunately for his object Mr. West on his arrival made the acquaintance of an Englishman, a resident of over twenty years, without whose assistance he would scarcely have succeeded.

This resident, by his energy and determination, brought the affair to a successful termination. Besides the figs, he took cuttings of other plants. This little incident serves to show that the Smyrnaites ought not to be so indifferent to such important matters. By this time Mr. West is on his way home with his cuttings, and, for the sake of the Smyrna trade, it is to be hoped that the fig will not take in California, though the chance is very slight. If it does, however, America will supply the European market with better "Elemé" than Smyrna ever produced. Another matter which should not be forgotten is that American machinery will, no doubt, take the place of manual labor in packing. The prospect of losing the fig trade is a sad one, and should provide food for reflection for all who live by its product in Asia Minor.

[We do not quite agree with our correspondent, for a Smyrna-grown fig, pomegranate, etc., will never be anything else, namely, the best in the world. Seeds and cuttings may

be taken to America or elsewhere, but a foreign soil will never be able to give the same nourishment and strength to the new produce so that no difference would be known between it and the old. At the same time our correspondent is, no doubt, right about the want of precaution on the part of those who run a great risk in jeopardizing the Smyrna fig trade.—Ed. "Oriental Advertiser."]

After a journey of seven months, the cuttings arrived in Fresno May 24th in good condition. Much to my surprise, most of them had sent out numerous roots into the sawdust, which was still in a moist condition, having no doubt absorbed moisture during the transit across the Atlantic. On account of the lateness of the season not more than about one third of the cuttings grew, the warm weather having already commenced, and were planted out in the orchard at the Fancher Creek Nursery the following year, where the trees are now growing vigorously in light, sandy, and well-drained soil. The Smyrna fig grows in what is known as the Aidin Valley, distant about seventy miles from the coast, and comprises the following districts: Erbeli, Nazli, Denizli, Balachich, and Aidin proper; but the choicest figs are produced in Erbeli, although the other districts grow a fig almost equally as good. There has been no regular system followed in planting fig orchards, each grower following his own fancy and ideas, the average distance being about thirty feet. In the orchards set out in recent years, however, the trees are planted fifty feet apart each way, and are trimmed four and one half to five feet high, so as to allow the cultivator to circulate under them without hinderance; the trees having been trimmed to their proper height, are never pruned unless the interior becomes too crowded with branches, in which case they are removed to admit a free circulation of air. The orchards are well cultivated, but are plowed shallow and are kept clean of weeds, the object being to have the ground in such a condition that the figs can be easily found when the fruit ripens and drops. The best figs are grown in the valleys, though the orchards sometimes extend up into the foothills for a short distance.

Heavy argillaceous soils are not suited to the fig, the soil (a sample taken from Erbeli, to which I beg to call your attention) resembling very much the sandy soils to be found in the San Joaquin Valley. The trees are irrigated during the first two years only, it being claimed that after that no water is necessary, as the fig succeeds just as well without, and to water the trees when in bearing would ruin the crop. Irrigation is practiced in the same primitive manner as it was a thousand years ago, water being carried to the trees in goat-skin sacks. The fruit, when ripe, is said to be of a greenish yellow color; the pulp seems to vary in different soils, in some being amber, others of a pinkish shade; although, when dried, this does not materially affect the fruit, as there is no difference in the flavor or external appearance. There are a great many varieties of figs grown in Smyrna, but there is only one kind which produces the dried fig of commerce. When the fig is ripe it drops to the ground (it is never pulled nor cut from the trees) of its own accord at the proper stage of ripeness; if gathered too soon it is worthless. Every morning and evening the figs that have dropped are gathered and are taken to the drying-ground, which is usually a space among the fig trees where some have failed to grow. A sort of hay, or more properly, a rush, which is indigenous in the Aidin Valley, is spread on the ground in rows about four feet wide, two inches deep, and a space is left between each row three feet in width for the convenience of the men handling

the fruit. The figs are laid on this bed of rushes so that they will not touch each other, no particular care being taken whether the eye is up or down, as the fig is about half dried when it drops from the tree. After the figs are spread out they are not touched until fully dried, which takes about five days. There is really no necessity for further handling, as the hot air circulates freely above and below the fig, and dries it equally on all sides. The figs, when dried, are collected in baskets and carried to a shed, where they are deposited in large heaps, then sorted in three grades. Nos. 1 and 2 are put in goat-skin sacks and taken by camels to the nearest shipping points. No. 3 consists of the worthless and split figs, and are used for distilling purposes. The Smyrna fig only bears one crop annually; that is, only one crop which matures fruit. The figs appear in the latter part of June, are fertilized in July, and mature their fruit from August 15th to October 1st. As to the growing of the wild, or caprificus, I shall make reference when I take up the subject of caprification.

GRADING AND PACKING.

Goat-skin sacks are used for the shipping of the dried figs, because the fiber from an ordinary sack would adhere to the figs, which are sticky and sugary, while goat-skin sacks leave them perfectly clean. The figs on arrival at the railroad depot in the city of Smyrna are loaded on camels and distributed to the different packing houses, or, if not consigned, are taken to the fig market to be disposed of at auction. The packing houses are all large establishments, employing from three to four hundred men and women, who are paid according to their expertness. The layer packers receive the highest wages—from 75 cents to \$1 25 per day; sorters, mostly women, are paid 20 cents a day. The figs when brought to the packing houses are emptied out of the sacks in large heaps, around which are seated women with stone jars near them filled with sea water. These women grade and supple the figs. The salt water is used to prevent the figs from sticking to the fingers, and also to assist in suppling. The grader takes up a fig, closes the hand over it, turns it once or twice, then pulls it until it is shaped like a bag. This handling of the fig leaves it very soft and pliable, and it is now again graded by pitching it into basket No. 1, 2, 3, or 4, according to its quality. These baskets are about twenty inches in diameter, with sides about four inches high, and when filled are taken to the packing-rooms, which are long and narrow, being from eighteen feet to twenty feet wide, with narrow benches about three feet from the wall on each side running the length of the room, with one row of packers on each side, leaving a vacant space in the center of the room for the convenience of the boys bringing in the figs and taking away the packed boxes.

On the bench within reach of each man are placed stone jars of sea water, in which are leaves of the laurel left there to moisten; the packer keeps his hands very wet by frequent dipping in the jars. The men packing No. 1 all sit together, likewise Nos. 2 and 3; the No. 4 is not packed, but is pressed in drums. When a basket of No. 1 is placed before a packer he grades the figs again by taking all the best figs out and passes those remaining to No. 2 packer, who again selects and passes to No. 3 those which do not suit him. The figs are put up in half-

pound and twenty-pound boxes. The packer takes a fig out of the basket before him, squeezes it flat, and by using his thumb and forefinger of each hand he brings the stem of the fig on the upper side, and the eye, or ostilum, underneath; he then pulls the fig as much as possible, squeezing it very thin; then again takes the fig in both hands, with the stem end turned down, the thumbs being pressed closely together on the opposite side, with the two forefingers placed firmly against the fig underneath. Still pressing the thumbs down he gradually draws them in opposite directions, and splits the fig by this process from the stem to the eye; then turning the stem towards him he straightens the fig out, making the sides nearly square, when it is ready to be placed in the box. This is the most difficult part of packing, the object being to have the bottom layer look as well as the top, should the box be opened from the bottom. I have examined large boxes of Smyrna figs, and have found without exception one layer packed just like the other.

The lines between the layers could not be straighter, even if they had been ruled; this mode of packing cannot be done, however, unless the fig has been split, thus permitting the drawing of the fig out until it is almost twice its original size. After the first layer is packed, the box is changed ends, the next layer being packed the other way, and so on until the box is filled. In the top layer, which is almost one fourth of an inch above the top of the box, four or five leaves of the bay laurel (*Lauris nobilis*) are placed. The boxes, without lids, are then taken by the boys and placed in stacks four to five feet high, and after a few days the weight of the boxes presses the figs down, so that the lid can be nailed on without any difficulty. No presses, no machinery of any kind are used; all the work is done by hand; this mode of packing is called "Elemé-pulled figs," Elemé meaning selected, and pulled meaning the pulling they go through in packing. The majority of the figs are packed this way, the trade demanding it, but by far the most sensible is the bag-shaped packing; the figs are not pulled, but are placed in boxes in square form, which is a much cleaner method of packing than the other. The residents of Smyrna have a very decided antipathy to the pulled figs, most likely on account of the filthiness of the lower classes of Turks, who do the packing. We would do well, in my opinion, to follow the example of the natives in purchasing the imported fig only when packed bag-shape, and thus encourage this mode of packing.

CAPRIFICATION.

This, the most important step necessary to produce the Smyrna fig, has been a subject more discussed than any other in connection with it. It has had but few advocates, most of our horticulturists being under the erroneous impression that it was a worn-out custom, which had been revived here with no other object in view than newspaper notoriety. That caprification is still practiced in Smyrna; that it has been a custom carried down from a time long before the Christian era and ever since the Smyrna fig has been an article of commerce, is an established fact of which none who have read any of the old works on horticulture can express a doubt. It is a singular fact that, of all the varieties of figs I have growing at the nursery, the Smyrna are the only ones which require caprification to mature fruit, all the other varieties maturing their fruit without having the flowers fertilized; but still the latter, looking at it

from a scientific point of view, are not perfect, the seeds being all hollow, contain no germ, and if planted would not germinate. Nature is often mysterious in her workings, and it does seem strange indeed that this one variety should not mature fruit unless the seeds are fertilized. Experience, however, has taught the fig growers of Smyrna that unless they have the wild figs placed among their Smyrna figs the crop is a failure; and in years when the wild fig crop is scarce, caused by early frosts or other climatic conditions, the wild figs command a very high price, and are sold in the villages as merchandise. The caprifigs are not generally grown in the orchards, but in the hills, and where they are grown receive very little attention. One tree of the caprifig is considered sufficient to fecundate several hundred trees of the female fig.

The orchardists of Smyrna can give no clear explanation for the necessity of hanging the caprifig on the branches of the Smyrna, but they invariably assert that unless this method is strictly followed there will be no ripe fruit. The fig growers of Smyrna are evidently not a class of people who make it an object to investigate the wonderful workings of nature, but they accept the gifts of the Supreme Being as a right which they think Providence should have bestowed upon them. California horticulturists, however, they will find do not look upon a subject of such a vast importance with the same indifference, and I think I can safely predict the successful production of the Smyrna fig in such quantities in a few years hence (if brains and intelligence play any part in the success which has thus far followed the efforts of our leading horticulturists) that will make the editor of the "Oriental Advertiser" believe that after all his correspondent did not miss the mark very far when he prophesied "California would soon become a rival of Smyrna in the successful production and exportation of the genuine Smyrna fig." The caprifig and the Smyrna fig stand in the relation of male and female to each other, though it must be understood that the wild fig, being called the male, its flowers are not all male, nor are those of the other all female, for they contain both male and female, the former predominating in the second crop of the wild fig.

To properly understand caprification, and the manner in which the pollen is carried to the female fig, it will be necessary, first, to explain the construction of the caprificus. This fruit, known as a fig, though worthless as food, is really a hollow inflorescence, the greater part of the hypanthodium being lined with female flowers, which are mature when the eye of the young fig opens; while the male flowers, occupying a limited zone near the eye of the fig, mature later, when the fig is ripe. The caprifig ripens three crops annually, the first appearing in April, the second in June, and the third in August, the second and third crops beginning to flower when the previous one is ripe. The wild fig, as well as the cultivated, is monœcious, and also markedly protogynous (protogynous plants are those in which the stigma has lost its capacity for fertilization when the pollen matures, so that the fertilization must depend on the pollen from other sources). The propagation of the fig wasp takes place in the following manner: The female wasp forces its way, with the loss of its wings, into the fruit of the caprificus through the narrow ostolium, or eye, and lays eggs in the ovaries of the female flowers between the nucleus and the integument, placing one egg only in each, and then dies within the fig to which it has intrusted its offspring. In consequence of the puncture made by the female wasp, the female flowers in the fig enlarge after the manner of a gall, and in place of its

own embryo in the ovary the wasp embryo develops. Although the figs are protogynous, the wasp is protandrous (that is, the male matures before the female). The wingless male insects are the first to appear. They gnaw their way into the ovaries in which the female lie, impregnate them, and then perish within the fig in which they were born. The winged female then escapes by widening the passage made by the males, and either enters the following crop of the caprificus, when the same process as the above described takes place, or, if the fruit has been removed before and hung in the branches of the Smyrna tree, the wasp forces its way through the eye of the female fig, then in proper state of maturity to admit its entrance, and in its endeavor to lay eggs, and laden with pollen obtained in its outward passage from the caprifig, fertilizes the female flowers and perishes, leaving no offspring; as in the cultivated fig, the female flowers are so constructed that the wasp is prevented from laying its eggs in the proper place. The prevailing practice in Smyrna is to attach two caprifigs to each end of a rush, and from three to four are hung in each tree.

All the figs thus fertilized will mature good, edible fruit with solid seeds, while those escaping fertilization do not develop, and are worthless, and drop to the ground when about the size of a Damson plum.

My own experience with the Smyrna and caprifig generally confirms the above-mentioned reports, and differ only in some minor details, which may be ascribed to the fact that my trees are too young to produce fully developed fruit. One year ago the two varieties fruited, the wild figs ripening from June 15th to July 1st, and the Smyrna was then the size of a plum, the female flowers being at this time in proper state of maturity to receive the pollen. Not having the Blastophaga, I decided to try an experiment, although I felt extremely doubtful of success. I opened, however, quite a number of wild figs, shook the pollen into the palm of my hand, then rubbing a wooden toothpick in this pollen, introduced it into the orifice of the fig. Of the four figs fertilized every one matured, while all the other figs on the tree, when only half grown, dried, shriveled up, and dropped to the ground. After the fruits were dried I carefully examined them, and to my surprise found a large number of the seeds perfect; that is, had a seed germ. On tasting them I found the flavor to be very similar to that of the imported article, though not fully equal to it, for the simple reason that only a portion of the female flowers had developed seeds as a result of the rude manner of fertilization. This experiment proves conclusively to my own mind that the wild fig and the Blastophaga are necessary for the production of the Smyrna fig. The figs in the green state are palatable, but it is only after being dried that they acquire that fine, aromatic flavor which entitled them to be called the "king" of all dried fruits.

This year I repeated the experiments on a more extensive scale, and succeeded in obtaining one hundred and fifty fruits. Several gentlemen who are now present have tasted them, and will, I believe, testify to their well-defined resemblance in flavor to the imported article. There is not the slightest doubt in my mind that we have in California the true Smyrna variety, as well as the wild, or caprifig, and all that is necessary for the successful production of this most delicious of dried fruits is the little wasp, "Blastophaga." Some very valuable parasites for the destruction of scale insects have been successfully imported into this country, and there is no reason why the Blastophaga should not be introduced. If the State Board of Horticulture, the Director of the

Agricultural Department, or probably better, the Director of the Entomological Department at Washington, could be interested in this matter, I believe there would be no difficulty in bringing out the insect in a live condition. We as individuals can, of course, import the insect, but the Government, through its departments, has a much better chance of success.

In connection with this subject I take the liberty of stating that besides the Smyrna and wild figs, we also imported the following varieties: Cassaba and Bardadjik, and three other sorts of which I have no description. None of these varieties will produce fruit unless the flowers are fertilized, the fruit falling off prematurely if not caprifiged.

The Cassaba fig is small, of a dark green color, and the pulp is of a highly colored red tint; is for table use, and does not dry well. Bardadjik has a longer stem than the Aidin fig, is pyriform, and is shaped very much like a water jar, from which it derives its name; the skin is yellowish green, the pulp of a greenish tint; the fruit is delicious when green, and when dried is preferred by the Smyrna residents to the Aidin fig. When dried the fig is small, but is very highly flavored.

California stands to-day as the only rival of Europe in the successful production of raisins, olives, wine, and prunes, figs being the only staple product wanting in the list, and it will be but a few years when it can be included.

THE NICARAGUA CANAL.

MR. CLAYTON offered the following resolution:

WHEREAS, The construction of the Nicaragua Canal is of the utmost importance to the Pacific Coast, and especially to California, in giving speedy communication with our Eastern cities, and with Europe; and whereas, the ownership of the same by the United States is, in our judgment, an absolute necessity to the future welfare of that part of the United States lying on the Pacific Coast; therefore, be it

Resolved, That this Convention recommend our Senators and Representatives in Congress to urge the building thereof by our Government, or to furnish aid to the present company by guaranteeing their bonds to a sufficient amount to pay for its immediate construction.

Adopted.

MR. BUCK: I wish to ask those committees that I have appointed to report at the evening session.

REPORT OF COMMITTEE ON MR. LUBIN'S PAPER.

MR. PRESIDENT: Your committee appointed to take into consideration the paper of Mr. Lubin, and to recommend such action as the importance of the subject presented demands, herewith offer the following:

Resolved, That this Fruit Growers' Convention heartily indorse the plan of Mr. Lubin, and recognize therein the probable solution of the most difficult problem connected with our fruit industry, viz., the disposition of our fruit at a profit to the producer and at a low price to the consumer, without the intervention of middle men or commission merchants.

Resolved, That the experiment be first tried in San Francisco by some local county organization, and that the moral support of this Fruit Growers' Convention be pledged to any such an organization as will undertake the experiment.

N. W. MOTHERAL,
P. W. BUTLER,
D. LUBIN,
JOHN MARKELEY,
G. M. GRAY,

Committee.

Report adopted.

FRUIT CONSUMPTION—HOW TO INCREASE IT.

By C. H. ALLEN, of San José.

I have been invited to prepare an essay for this assembly upon the subject, "How to increase the consumption of California fruit." When I accepted that invitation I fully intended to prepare a paper, but during the four or five days I had in which I expected to perform that duty, the "grip" got hold of me, and I could do nothing but think, and not much of that, so I appear without a paper.

Political economy, in treating of the relations of man to the objects of his desire, divides the subject into three distinct branches: Production, distribution, and consumption. The division is a natural one, and one I think that will be profitable for us to observe; in fact, one which we have observed in the deliberations of this body. It is not strange that in a State like this, new as we are, that the first division should have absorbed a large portion of the attention of such a body as this; in fact, nine tenths of the deliberations of the horticultural meetings are devoted to the subject of production. How can we produce the best fruit? How shall we prepare it for the market? What are the courses we shall take up for the production? and subjects of that nature. All these belong under the general head of production.

The second subject, the matter of distribution, has, at this meeting, received a great deal of attention. How, after the fruit has been produced, after it has been prepared for market, shall it be distributed? These, as I say, we have already discussed; they have formed a large part of the discussions of to-day.

To the third, the matter of fruit consumption, we have given very little attention, and for the short time I occupy your attention I desire to speak almost entirely upon "fruit consumption."

It is no use for us to produce large quantities of fruit, if we cannot find a market for it when it is produced; and the making of our market, and the making of our fruit so well known that it will command a market, or that it will be demanded in the market, is, of course, a vital question for us. The matter of production has been carried to such an extent that we are now anxious for the market. It is not many years ago when the same crop that was produced upon my place was taken off of my hands by dealers in San José at 17 cents per pound. At that time we did not need to discuss the question of fruit consumption. All the fruit that could be raised was consumed right around there. There was no trouble about marketing it. The crop this year hangs fire at 5 or 5½ cents per pound for dried fruit. Now, that shows that the production has increased far beyond the point of consumption. Now, how shall we increase the amount of fruit consumption? In the first place, our fruit, if we want it readily marketed, must be honest fruit. It must be put on the market and be what it is claimed to be. We are making the fruit better and better every year. The prunes I have been preparing this year are far better than the prunes I got 17 cents per pound for a number of years ago. I have learned more about it; they are just as nice as they were then. But our fruit trade has been sadly interfered with, because our fruit growers and fruit dealers, forsooth, are not all honest men. Not many years ago, when there was a great demand for the Yellow Egg plum, the fruit growers in our part of the State pulled

their prunes not over one half or two thirds grown, and sold them to the canneries. These were canned and sent East for the "Yellow Egg plum." There was an immediate gain of 3 cents per pound, but it paralyzed the trade for Egg plums, and the same thing has been done with the Silver prunes. I sold my Silver prunes two years in succession for 16 and 17 cents; now you can hardly get 7 or 8 cents. We are paying for that dishonesty; and so, you see, if we are going to get a good market, it must be by square, honest dealing.

The second point I make is, that we must learn to produce our fruit so cheaply that it can be sold at rates that will bring it within the reach of the poorer classes of our country. Dried fruit is the poor man's fruit; wealthy persons eat canned fruit, but the laboring man who supports his family by the sweat of his face, the man who works at day's labor, is the man on whom we must rely for the marketing of our dried fruits. Our dried fruits, therefore, must be raised and prepared in such a way that they can be bought at a very low rate. When I got 17 cents a pound I made an enormous profit. If I should sell them this year at 9 cents a pound I should make a fair profit. We must be prepared to work more economically if we want to bring our fruits down where the poor fellow can afford to buy it. We must learn how to prepare fruits for the various markets. I came into the possession of a fact not long ago, which seems to me to be a vital one for fruit growers, and that again illustrates the point I wish to make. Medical authority has decided that the acid of the apricot seems to be just exactly what is needed for the prevention of scurvy, and, if this be true, we will have the navies of the world to supply. But they must be sold cheap, or else they will not buy them. You can go right into the orchards and put them into the cans there and make a good profit at 4 cents per pound. Of course, there may be finer ones put up, but you must study the matter of consumption, and this is especially so with our larger fruits. Two years ago an entire shipload of our cheap prunes in sacks went on board of an English vessel, to be carried over to England for the sailors to eat on board ship. Now, if we can raise cheap fruit we can have all the navies for a market for the apricot crop. Our ideas have generally been too high; we have been wanting big prices; we have been wanting to get rich too soon, but we must be patient and wait. Let us study the market for the various kinds of fruit. I have no doubt there could be a very large trade built up in England for our prunes, for they will compare with the best French prunes, but they will have to be differently prepared unless the consumers are educated up to the fact that this fruit must be cooked and not eaten out of the hand. At Almaden, near San José, they buy this fruit, and it is eaten entirely by the workmen, who take them in their dinner baskets and eat a dry handful of prunes out of their hands, uncooked, but it probably would be better for them if they were cooked.

The next point is this: We have come to that period in human existence, in this country, anyhow, where a thing to be known must be advertised. Our fruit has not been advertised. If a man wants to introduce a new brand of cocoa he sends it out here and sends a drummer with it; he gets a corner in the Farmers Union store, and he sticks up a few dozen placards in town and invites every one to come from 2 to 4 o'clock to drink a cup of cocoa, and then everybody comes and buys that product, and in that way he gets it before the people; and so with a dozen other

things that we have been introducing in San José within the last two or three years. The placards are visible everywhere and the market has been made. Why cannot we do something of the kind? Consumption is largely a habit. People get into the habit of putting in so much stock in the fall for the winter supply. They have, in that part of the East where I passed my boyhood days and some of my early manhood, the habit of drying so many sacks of apples in the fall for the winter consumption. The earliest, bitterest, wormiest apples were dried, because the others would sell when these would not; they were quartered, cored, strung, and hung up on the rafters, and in various parts of the building, and the fruit for the year was accumulated. When so many apples had been pared and hung up—and I tell you truly that was the only fruit I ever ate until I was twenty years old, except dried figs or dates—they would consume them as they needed them. I say, then, that the matter of consumption is largely a matter of habit. We must get people into the habit of eating California fruit if we are going to sell it.

I was with "California on Wheels," and when I got east of Chicago I found very few persons indeed who knew anything about our California dried fruits. They would ask: "What is this?" "Where is this made?" "Where can we get that?" They wanted to know whether we had any dried apples in California, because they knew they would sell; but it never occurred to them that they could sell prunes, peaches, and apricots, but they knew they could dispose of dried apples. Why not push our fruit in this way by advertising it? I do not see why we should not have and use those large, attractive placards in this business that other people do in other industries. If we want to sell our fruit we must advertise it.

RESOLUTION.

MR. BLOCK: I made a motion in regard to the paper read by Mr. Rowley, that it be referred. In place of that I propose the following resolution, and I hope the same will be adopted:

WHEREAS, The present railroad charges on fruit shipped to the East from the Pacific Coast are in excess of our ability to pay and make business reasonably profitable; therefore, be it

Resolved, That we, the fruit growers in Convention assembled, hereby request the Southern Pacific Railroad Company to assist us in procuring a reduction of 25 per cent on present freight rates; and be it further

Resolved, That a copy of these resolutions be sent to the Southern Pacific Railroad Company by the Secretary of this Convention.

Adopted.

MR. BUCK: Mr. Caminetti, who has been elected as a member of Congress from this State, is present, and as there has been something said about a memorial to Congress, I am very glad that he is here. He told me he was perfectly willing to do, so far as his ability would allow, anything that the fruit growers of this State wanted. I think this would be an opportune time for the committee to report, and then we can listen to the remarks of Congressman Caminetti.

REPORT OF COMMITTEE.

MR. AIKEN: Your Committee on Congressional Memorials begs to report as follows:

MARYSVILLE, November 19, 1891.

To the State Fruit Growers' Convention:

Your committee appointed to draft memorials to Congress and the Secretary of Agriculture, and present the same to this Convention for adoption, respectfully submit memorials on the subjects referred; and upon adoption, recommends that copies be furnished to the California delegation in Congress and to the honorable Secretary of Agriculture.

W. H. AIKEN,
CHAS. H. ALLEN,
B. F. WALTON,
Committee.

MEMORIALS.

MARYSVILLE, CAL., November 19, 1891.

To the honorable the Secretary of Agriculture, Washington, D. C.:

Your petitioners, fruit growers of the State of California, in Convention assembled at Marysville, this nineteenth day of November, 1891, respectfully represent that their soil and climate are adapted to the successful production and preparation of fruit and fruit products of good quality, and in quantities sufficient eventually to supply the markets of the United States.

That the knowledge of the quantity and quality of foreign fruit products is of great value and importance to the horticulturists of this State.

Your petitioners therefore respectfully request your kind offices in obtaining and disseminating such information.

MARYSVILLE, CAL., November 19, 1891.

To the honorable the Senate and House of Representatives of the United States, in Congress assembled:

Your petitioners, the horticulturists of the State of California, in Convention assembled at Marysville, Cal., this nineteenth day of November, 1891, respectfully represent that they are engaged in the growth and preparation of fruit and fruit products for the markets of the United States, of good quality and in quantities to largely supply the demand.

That the adulteration and false and irresponsible labeling of fruit products, such as canned and dried fruits and olive oil, have become a serious obstacle to the profitable marketing of properly prepared and healthful articles of food in this country.

Your petitioners therefore respectfully request such legislation as will prohibit the adulteration of food products in this country, and the importation of such adulterated products.

REMARKS OF CONGRESSMAN CAMINETTI.

Hon. A. Caminetti, being introduced, spoke as follows:

I have been engaged for the last two or three weeks in making a tour of my district for the purpose of ascertaining the wants of the different counties composing it. I am very glad that I am, at this time, making a tour of this part of my district, and to come into contact with this Convention. Although I had not the pleasure of meeting you before, I am not a stranger to you, nor to your work. Being in the Legislature for eight years it was my pleasure, at each session, to fight gladly for the appropriation for the maintenance and support of the State Board of Horticulture. [Applause.] I am very glad to be able to say, that after an investigation of your work, I am not disappointed in having given you my aid in the past. I believe of all the Commissions that the State of California has supported within the last ten or twelve years, the State Board of Horticulture has done more good than all of them put together. Now, I am not talking for electioneering purposes, as the electioneering time has certainly past, and besides, my district is largely Republican; but I am talking for the purpose of ascertaining from the people, and from bodies like this, the wants and

requirements of the people of my district, and of the State. It has been my peculiar work in the Legislature to address myself, as far as my ability enabled me to do so, to topics bearing on the material advancement of the State, and to topics pertaining to school matters. I do not intend to go to Washington for a holiday, but go there for the purpose of doing the work that is expected of me, and this is my reason for going through my district, in order that I may form acquaintances from whom I can get information, in case, at any time during the progress of my work in Congress, it may be necessary to write back for information upon any subject that may arise.

I saw by the opening address of your President that there are several matters interesting your people and your industry that might come up properly before Congress, in addition to the matters you have laid out in the two memorials. I will say, as far as those memorials are concerned, I believe that they should be adopted. I believe Congress should look into them. I believe California and some other portions of the Pacific Coast are entirely different and distinct from any other section of the United States, and, I may say, of the world, having within their limits a great many climatic conditions. The rules that apply to the other States will not apply to California, therefore we must have a different rule of action. I propose, if it meets with the approbation of those interested in that particular, to offer for congressional consideration a bill to organize a bureau or department of agriculture, with its headquarters at San Francisco, bringing it nearer to the people to effect the work they intend to accomplish, so that those of you who are interested in agricultural or horticultural industry can apply to this bureau for the information that the Government should furnish. The Government has organized a Department of Agriculture by appointing a Secretary, and has given him a place in the Cabinet. It seems to me it could do no better, in providing for its development, than to attend to this peculiar want of the Pacific Coast. In order that I may succeed in this I may require assistance of all who are interested in this matter in California, and when I shall apply for that assistance I hope I shall receive it promptly, in order to enable me to carry on the work with vigor.

There are other questions that are liable to come up, and I have seen by the reports of this Convention they have already come up before you; for instance, the forestry question. In 1883 I introduced the first resolution in the Legislature of California having in view the protection of our forests, and I believe we have carried on an insane policy with respect to them. I believe we are on the road that Spain has long since traveled to her cost, and to whom we should look and profit by her experience. I believe all the unsold timber lands of the United States should be withdrawn from sale, and should be kept intact for the public benefit. I believe under the law we should look towards the planting of forest timber in some spots that do not now possess forests.

There was a letter read before this Convention asking that it take steps to prevent the county of Mariposa from getting six townships of land from the national reservation known as the "Yosemite National Park." I do not know the gentleman who read that letter, but I have just come from that section. I have taken special pains to go over those six townships, and I do not know why those people request that that should be withdrawn from the National Park. There is nothing

upon those six townships, with the exception of two sections containing the Merced grove of Big Trees and the Tuolumne grove of Big Trees, and, unless we desire to dismember the county of Mariposa, it seems to me that we should return the land that was taken, with the exception of the land including the two Big Tree groves. I speak advisedly; I speak from the investigation made by myself. Of course, there are lots of questions that are likely to come up.

I will say, in general terms, that I want it distinctly understood that this association, or any other association of like character in California, that may require any attention in Congress, shall have my individual efforts from the time that I arrive there until the session closes. I thank you sincerely for your attention. [Applause.]

ADOPTION OF MEMORIALS.

The question of adopting the memorials was put to a vote, and carried unanimously.

PEACH GROWING IN THE SACRAMENTO VALLEY.

By C. E. WILLIAMS, of Marysville.

I have been requested to present something for your consideration on the subject of the peach in the Sacramento Valley. Recognizing how little I know compared with some of you, I approach the subject with extreme reluctance and diffidence. I shall not attempt to discuss varieties most profitable or most easily grown, methods of pruning or cultivating, or, indeed, any of the details of the work of the peach grower, but will endeavor to present to you a few facts and ideas in regard to the business as a whole.

So far as my information goes, the first peach trees ever planted in the Sacramento Valley were set on the banks of the Yuba River, some two or three miles above the city of Marysville. There, in 1852, was planted the first peach orchard of this section, and probably the first in the State to assume prominence from a commercial standpoint, although peaches had been grown by the Spaniards for nearly one hundred years previously. From the small beginning there made by George C. Briggs, the business has increased until there are now in the Sacramento Valley and adjacent foothills almost two million peach trees, of which one and one quarter million are in bearing. A conservative estimate of the value of these orchards is from \$5,000,000 to \$6,000,000. The annual product is not less than one hundred and fifty million pounds, which should be worth not less than \$3,000,000, or a gross return of \$150 per acre. Of this \$3,000,000 a large part is expended for labor in the orchards, and other large amounts are paid by the canners, shippers, and driers who handle the product. This great sum of money is paid to the workingmen, who immediately distribute it among the various classes of merchants, and thus it at once enters into the regular channels of trade, benefiting all more or less.

That the business of growing peaches has increased beyond the expectation of its most sanguine and enthusiastic advocates of ten years since, we must all admit. It has come to be a leading industry, but it has had to advance to this position in the face of much doubt

expressed as to the success of those who put their money and time into it, and very much more doubt which only found expression in "acts louder than words." The planter of peach trees has been continually met with the question: "Are you going to have a market for your peaches?"

Most propositions have both a negative and an affirmative side, and this question, "Are we going too fast in the planting of peach trees?" is no exception to the rule. This question was, I presume, asked of Mr. Briggs and his associates shortly after their first trees commenced to bear. It has been repeated less and less frequently each year, as the acreage in peaches has increased, until the present season, when it has been more often heard than for several years. This is because of the extremely low prices that have prevailed in the East for all lines of our fruit—canned, dried, and fresh. It has given the croakers a chance to say that what they have been predicting has come to pass; that the whole business is on the verge of bankruptcy, and that another year or two will see the orchardists begin to uproot their trees or the Sheriff be in possession. Much of this kind of talk has been indulged in in this and all other parts of California during the past few months. Is it true? Has a peach orchard ceased to be good property? Have these talkers good ground for their talk? To all these questions I most emphatically answer, "No."

It is one of the unfortunate things connected with fruit growing that every few years the growers get more for their product than they should. It is unfortunate, because it always demoralizes the business at the consumer's end of the line. Last year it did this to such an extent that that alone is almost sufficient to account for the low prices now prevailing. When taken in connection with enormous fruit crops in the East, an early fruit season there and a late one here, a money panic which disturbed all trade, and has not yet lost its depressing effect, we have a sufficient array of reasons to account for our present depressed markets. This is still further aggravated by a warm fall and late commencement of winter in the East. This has been about equally true of all varieties of fruit, but has been most marked to us with peaches because we produce more peaches than any other one kind.

"But," says the owner of land well adapted to the growth of the peach, but not yet planted, "you have a fact staring you in the face: dried peaches are down to the cost of production, and while your theory, that they will be higher, may be right, I don't know it."

Dried peaches are not down to the cost of production. In an orchard in full bearing the cost of dried peaches in this vicinity should not be over 3 cents a pound, and I believe that some growers have reduced it to 2½ cents for every cost, including cultivating, spraying, and everything except interest on the capital invested; so that there should be a reasonable profit left at 6 or 7 cents a pound for the dried product.

But should the business be overdone, who will first be obliged to go to the wall? Evidently that grower who has the fewest advantages; and he who can produce the largest amount of the best fruit at the least cost will be the best able to withstand a period of depression, and will be the first to reap the benefit which must come later on from the resulting decrease of production. We claim for the best parts of the Sacramento Valley advantages in peach growing that are of much importance. "By their acts ye shall know them." Three of the largest canneries in

the State have for a long time shown their appreciation of our peaches: the Golden Gate Canning Company, by establishing a branch here in Marysville; A. Lusk & Co., by purchasing one of the largest orchards in Sutter County; and the San José Fruit Packing Company, by every year making purchases of Sutter County peaches and shipping them to San José to be canned. This shows the esteem in which our peaches are held by canners outside of our valley.

Leading shippers have said that on account of the earliness of ripening, and the high color and firmness of our fruit, there were few localities that could equal our immediate vicinity in the production of shipping peaches. When we take the whole Sacramento Valley into consideration, we find that it produces almost all the peaches shipped fresh from California.

But, however, it is in the line of dried peaches we can claim the greatest preëminence. Our growers can dry fruit for practically the cost of cutting and spreading it, except the expense of a dry house and the management of the same over some localities. Our fruit not being irrigated dries heavier than that which is grown on irrigated lands, averaging for peaches 5½ to 6½ pounds of green fruit to the pound dried, against 6½ to 8 pounds from trees requiring irrigation. These are advantages to the peach growers possessed by our section. They are, however, of less importance than the matter of quality, quantity, and regularity of crops. What country can show a record of 9,600 pounds of peaches per acre from one hundred and sixty acres of two-year old trees; or 27,300 pounds from four-year old trees; or eight acres of two-year old trees producing \$3,000 worth of peaches, sold at an average of not quite 2 cents a pound; or six-year old trees producing 600 pounds, or at the rate of 30,000 pounds to the acre? Such instances might be multiplied until we were all tired. Growers of peaches on such land need have little to fear from overproduction.

But I do not want our friends from other parts of the State to think that I am predicting failure for them. I merely want to show that I believe that the best parts of the Sacramento Valley have less to fear than other less favored sections. To each locality some one variety of fruit seems to be best adapted, and that locality of right can boast of its preëminence in that fruit. I believe that we are justified in boasting of our peaches. We can challenge the world and not fear to find our equal. We acknowledge that other sections can grow as good or better apples, pears, apricots, grapes, or prunes. The peach stands near the head of fruits in point of popularity and in quantity used. The apple alone can question its supremacy. If the apple be king, then the peach is queen of the fruits. In the growing of this royal fruit we fear no rivals.

I have already touched upon a point which is of interest to us all—that of overproduction. We are not yet raising any peaches in California to speak of. Our product of dried peaches is only one half that of the raisin product. We have only exported about seventeen million pounds of dried peaches in any one year—enough for one good meal to each consumer in the United States. Our exports, by rail, of canned, dried, and fresh peaches have never exceeded two hundred million pounds, if all were reduced to green fruit. The average amount expended by the Eastern people, at the retail price, for our peaches, has never exceeded 20 cents for each hundred in population, or \$2,000,000.

These amounts, when put in the aggregate, seem large, but when reduced to the individual customer are ridiculously small. We are not producing many peaches, and there is room for more, but in order to make that room available we must make up our minds to grow and cure peaches at a price so that they can be sold to the average consumer—the man who works for a living. The grower must not think, as one gentleman told me last season, when he refused a fancy price for his peaches, that the Eastern people must have them, no matter what they cost. The Eastern people do not have to take our fruit. They can live without it, and they will, except in small quantities, unless they can buy it at a price that is reasonable. We are not yet growing enough fruit of any kind, if we are willing to grow it and not expect to pay for land and cost of improvements every year after the trees are two years old. We must consider that 10 cents a pound for choice dried peaches is like 2 cents a pound for wheat, something to be had very seldom, and even at 6 cents a pound we *can* grow more peaches than can be disposed of.

There are in Sutter County alone forty thousand to sixty thousand acres of excellent peach land, which is from two to three times the amount now planted in the whole Sacramento Valley, and forty times the present peach acreage in that county. Now, with such an area available for growing, it is useless to talk of what can be done. Such an acreage would require a force of ten thousand or twelve thousand men to pick and handle the crop during the busiest part of the season. The trees could easily be planted and cared for, but where would the labor supply to care for the crop come from? We could produce five hundred million pounds of peaches in Sutter County. We have only one twentieth of the acreage of the Sacramento Valley, and it is safe to assume that other counties could increase their product in the same proportion. But it is idle to talk of what can be done or to follow out those figures to the end, for we would reach amounts almost incomprehensible. It is equally foolish for any man to say that the business cannot be overdone. This does not, however, mean that it will be overdone. People are not rushing into the business with such undue rapidity as to make it dangerous. There will be periods of depression, as in other business, but in the main there is nothing to fear. There will be orchards planted that will be failures, but it will be the men who own and manage them who will be responsible for those failures.

To the man who owns peach land in this valley I would say: "Don't think you have a monopoly of choice fruit land. Don't think you can run a corner on peach growers. Don't think that the grower can afford to cover your land with twenty-dollar pieces in order that he may be permitted to plant peach trees on a small corner. Don't think that peach growing is all profit. If you fix your values on such a basis you will own the land for a long, long time. Sell land to the man who wants to set out an orchard, if you want to sell, at what it would be worth to the wheat grower, for that is the business that is going to cover the broad acres for many years to come."

To the man who is thinking of planting a peach orchard, I would say: "Come to Sutter or Yuba County. Choose carefully your soil. Don't think all land is alike. Don't even think that all parts of the same quarter-section are alike. Buy your land cheap, but don't buy cheap land. Study carefully successful orchards in your vicinity. Make selec-

tions of the right varieties. Plant and then cultivate. Cultivate your trees and fear not the result. Do good work and you will receive your reward. Don't expect to get rich from the first crop. If you do it will be an accident, and you will probably want so much orchard then that you will be worse off than if you had made less the first year. Don't do poor work. It pays nothing in any business, and a good deal less than that in fruit growing. Do all of these things well and you need fear none of the cries of the croakers."

DISCUSSION ON PEACH GROWING.

MR. LUBIN: In hearing that paper read and taking a bird's-eye view of it, I think it is a very interesting one. You are looking at this matter from a fruit grower's point of view. I suggested to the Chamber of Commerce some five or six years ago that it was the business of the merchant to aid in this work; that he should aid the progress of marketing the fruit; that they were better qualified to do so, in some respects, than the farmer; that the merchant can see and do things that are overlooked by the fruit grower. It reminds me a good deal of a man building a house, who put iron shutters in front and grated windows upon the top, and has forgotten all about the back door. Now, you can legislate and memorialize and pass resolutions that will have effect on transportation, but you cannot pass resolutions that will have the slightest effect on the men who are selling your products; you have not power enough to pass a resolution or act that will compel a man who sells your products to do anything of what you have been attempting to do. There was a gentleman here who said that fruit should be sold cheap and not at fancy prices, and yet I have heard remarks this morning that it was bringing 5 cents a pound—dried fruit. That is well enough, is it not? Now, I defy you to go into any grocery store in this city and buy it for 6 cents, which is a very high profit. You cannot do it now, unless you take steps to do what the gentleman said a little while ago, and put labels on your goods and put them in merchantable shape and sell them under your control. It is very well for you to protect the front end of your house, but unless you protect the other end, you can pass resolutions a mile long and a half mile deep, and they will not be worth the paper they are written on. You must follow the modes of trade, and unless you become a merchant as well as a producer, and get the laws of trade hammered into your heads, you will amount to nothing, and unless you do follow this out you will be at the mercy of the wind and air. How many of you eat chestnuts—5 cents worth in a year? I am not sure about that. I will guarantee that Italy puts more money into her citizens' pockets by the exportation to the United States of those chestnuts than we realize in prunes. Why? Because it is a product of food, and when the Italians come here they bring them with them and sell them on the street corner; but our dried fruit is sold in the grocery behind the counter.

MR. BUCK: I would like to believe and feel as Mr. Lubin, and if we could carry that plan out I think it would be just the thing; but I tell you when you undertake to ship green fruit three thousand miles away it will not keep quite as well as chestnuts. There is no question but

there are many abuses in all sections where fruit is sold at retail. The price paid by the wholesale man and the price paid by the consumer has a very wide margin. I only wish that I could see—and mind you, I am not saying this to say one word against the plan that Mr. Lubin is advocating, but would say amen to him or any other man who will attempt to carry out such a programme and plan of selling. If it could be successful it certainly would be the very thing for the fruit industry of this State. I have been East several times and have seen fruit arriving there, and I have seen it in such a condition that it had to be hauled onto the street very quickly and sold very quickly, too.

MR. MASLIN: I move that a committee of six be appointed to formulate a plan for the establishment of the Fruit Growers' Exchange in San Francisco, so as to carry into effect the plans and scheme of Mr. Lubin, by which means the fruit will go direct from the producer to the consumer.

Adopted.

COMMITTEE.

The President appointed John Markeley, of Geyserville; N. W. Motheral, of Hanford; S. J. Stabler, of Yuba City; R. P. McGlinchey, of Campbell; D. Lubin, of Sacramento, and R. L. Bohannon, of Big Bend, Butte County.

Adjourned until 7:30 p. m.

EVENING SESSION.

THURSDAY, November 19, 1891.

Convention called to order at 7:30 o'clock.

President Buck in the chair.

THE GUAVA, FROM SEED TO MARKET.

By R. C. ALLEN, of National City.

The guava belongs to the myrtle family and the genus *Psidium*. There are about one hundred species growing in the tropics and subtropics, mostly natives of America. Of these only a few bear edible fruit, the most universally known being the Pear-shaped guava, in California generally known as the Lemon guava. This variety grows as a tree-shaped shrub, twelve to twenty feet high. The leaves are entire, prominently ribbed, and somewhat downy on the under side. The fruit is about the size and shape of a Seckel pear, yellow outside and flesh-colored within. It has little value as a table fruit, few people caring for its peculiar flavor. However, the jelly made from it is held in high esteem, this being the variety used for the West Indian jelly commonly seen in our markets, and put up in wooden boxes.

It is not likely, nevertheless, that the Lemon guava will ever become popular in California, for it is very sensitive to frost, and properly belongs to a more tropical climate. It ripens its fruit in early winter, just when our weather is coldest, and has the additional objection of being very attractive to scale—as bad in this respect as the oleander.

The Red guava is a common variety in the East and West Indies, but seems to be unknown in this State. It resembles in tree and fruit the Lemon guava, except that the fruit is red, beautiful, but very acid. It is also used for jelly.

The species which has found most favor in California, and which seems to be perfectly at home in the conditions it finds here, is Cattley's, or the Purple guava. This variety was introduced into Europe from China, and in consequence called there the China guava, but it is now thought that it originated in Brazil. Here it is commonly known as the Strawberry guava, and it is safe to say that it will always be the guava of California.

This species is far hardier than the Lemon guava; scarcely more sensitive than the lemon itself. So far it has no enemies, always bright and clean, no matter what infests its neighbors. It favors a marine climate, succeeding most perfectly on the almost frostless mesas near the sea at San Diego and Santa Barbara. The hot, dry air of our interior valleys is against its best development. It requires abundant water, and, indeed, can hardly have too much. The perfect soil appears to be red mesa, underlaid at no great distance by red clay.

Commercially, this fruit is in its infancy with us. Hitherto it has been mostly planted as an interculture between citrus trees. This is objectionable, chiefly because the guava should be irrigated twice as often as the orange or lemon, so that in making one rule apply to both, one or the other must suffer. Then again, the guava is a gross feeder, and will be found before many years to have deprived the soil of much fertility.

The proper distance to plant is about eight feet by four. The bushes can be left at this distance for five years at least, and then trimmed out to eight by eight. They should be grown as bushes from the ground up, as this method of training facilitates picking, which is, at best, rather tedious.

The plants are generally grown from the seeds, which are very hard. They should be soaked thoroughly in hot water before planting. When the plants come into bearing a variety of strains will be found in the fruit, slight differences of shape and color. A longer experience will doubtless lead to developing the best types by budding, or by propagating by cuttings and layers.

There is a sub-variety of this species, having a yellow fruit, and known as the Yellow Cattley's. It is interesting chiefly as a curiosity, for it has no special superiority and lacks the strawberry flavor. The plants begin to bear at three years from the seed, and stand transplanting well. The fruit is about the size of an English walnut; on young bushes sometimes much larger; occasional specimens are found even two inches in diameter, but are very rare. The skin is deep red, indented, the inside red near the skin, shading to white at the center. Old bushes, unless severely cut back and fertilized, become sterile.

As fresh fruit the Strawberry guava easily leads all other kinds. Unlike the strawberry, its flavor can always be depended upon, and those who become accustomed to it nearly always end by preferring it to its namesake. It should be sliced, covered with sugar, and left to stand awhile before eating, care being taken to remove the astringent and blossom end. Excellent shortcakes, also, are made from it.

The fruit begins to ripen about the first of September, and successive

crops follow on until midwinter, or longer if there be no frosts. The first ripening which hangs on the bushes through the heat of summer is more astringent than the succeeding crops, and on that account less agreeable. Picked a little green it matures perfectly off the bush.

Guava jelly is generally acknowledged, in richness and flavor, to surpass all others. There are two methods of making the jelly in common use, namely, that of pressing out the juice from the raw fruit, and that of bringing the fruit to a boil before pressing. The latter method is to be preferred, not only on account of getting more juice to the weight of fruit, but especially because the distinctive flavor and coloring matter are chiefly next the skin, and the best of these qualities are left in the mash when the raw fruit is pressed. Made in this manner the jelly will be found to have the beautiful color and clearness of a rich Burgundy.

The cold-pressed juice yields a light pink or straw-colored jelly, deficient in fruit flavor, yet preferred by many who make lightness of color their standard of quality. It must be borne in mind, however, that if we expect to gain for this product an established position among the food delicacies of this country, it must be because of some positive quality, so that when people speak of California guava jelly, it will bring before their minds a distinctly characteristic thing. If they want something merely pretty with no particular flavor, they can make it in the East cheaper than we can furnish it. Nothing shows this more clearly than the example of imported guava jelly. With nothing to recommend it in the appearance either of the jelly itself or the package, its strong distinctive flavor has gained for it almost universal acceptance.

Our Strawberry guava jelly has a different flavor from the imported, more delicate, but very characteristic, still it should be given the benefit of all the qualities the fruit contains, and these, as before mentioned, lie chiefly next the skin, and can only be extracted by first heating the fruit.

A delicious jam can be made in the usual manner, the seeds being taken out with a coarse-meshed copper sieve. This fruit is sensitive to the slightest touch of iron, which turns the juice almost black. It is safer to use brass kettles for boiling, although granite iron or blue fruit-ware will do. The press must be carefully overhauled, and every iron nail or screw with which the juice can come in contact replaced with brass; the iron bands on the basket by copper, which must be frequently taken off and cleaned. In making jam it is necessary to remove the astringent blossom end, but in jelly it rather improves the flavor.

This branch of fruit industry is too new to be beyond the experimental stage, yet the prospects seem bright that an honest and meritorious article will find its place. It is unfortunate that some adulterated guava jellies are already upon the market, the name on the label being the chief clue by which the contents of the glass may be identified. As in olive oil, the known purity of our product will be indispensable to success.

THE DATE.

By J. M. ASHER, of El Cajon.

Not having statistics at hand I cannot give a tabulated statement of the importation of the date as an article of commerce, but will try to give an item or two that may interest some of the members of the Convention.

"*Phoenix* (the old Greek name of the tree, used by Theophrastus); Date Palm; synonyms, *Elati*, *Fulchironia*, *Phoniphora*; order *Palmea*. A genus comprising about a dozen species of palms, natives of tropical and sub-tropical Asia and Africa. Flowers yellow, mediocre; spikes growing out from amongst the leaves, and bearing flowers of one sex only, the two sexes being upon different trees. Both kinds have a cup-shaped, three-toothed calyx, and a corolla of three petals, with their edges valvate in the male and overlapping in the female, the former containing usually six (very rarely three or nine) stamens, with hardly any filaments, and narrow erect anthers, and the latter three distinct ovaries, with sessile, hooked stigmas. Only one of the ovaries, however, comes to perfection and ripens into a one-seeded fleshy fruit, the seed being composed of horny albumen, with a groove down the front, and the embryo placed at the back. Leaves terminal, spreading, and recurved, unequally pinnate; segments somewhat fascicled or almost equidistant, elongate-lanceolate, or ensiform, acuminate, with entire margins. Trunks, when present, usually rising to a great height, and covered thickly with scars of fallen leaves."

The species are readily raised from seed.

"*Phoenix dactylifera* (date-bearing); Common Date Palm. Flower, male panicles white, compact, six to nine inches long, on a short peduncle, the flower sweet-scented; female spike twelve to twenty-four inches long. Fruit generally reddish or yellowish brown when ripe, oblong, one to three inches long; pulp fleshy, sweet. Leaf gray, pinnæ eight to sixteen inches long, regularly distichous, often approximate in twos or threes on the same side of petiole, which is gray, laterally compressed, almost flat. Trunk covered with the persistent bases of petioles, the foot often surrounded by a dense mass of root suckers. Height in its native country, one hundred to one hundred and twenty feet. A handsome, erect-growing palm, the fruit of which is well known in the United States as an article of commerce. In its native regions nearly every part of the plant is applied to some useful purpose."

I have eight or ten kinds of the *Phoenix*; four *Phoenix dactylifera*, and seven or eight others that were sent to me as *P. dactylifera* by the Commissioner of Agriculture. The latter came into bloom in the spring of 1888. One proved to be staminate (male) and the balance pistillate (female).

The pollen from the one was applied to three of the others, purposely skipping the balance. Those skipped bore no perfect fruit, but the three that were pollenized were full of perfect fruit. One tree having nine branches averaged about seven hundred fruits each to the branch. My children liked the fruit, but it was so small it had no commercial value. The fruit having no value was allowed to drop to the ground, where, the following spring, it came up as thick as wheat under the trees.

In the spring of 1889 we pollenized those that had been omitted the

year before, and also one of those that fruited in 1888, with the same result as last year, viz.: only those pollenized perfected fruit. These palms are dark green, with beautifully recurved leaves, pleasant to look at.

One of the four *Phoenix dactylifera* referred to came into bloom this spring, and was fertilized (by hand) with pollen from a tree growing nearly a mile away, and now has four nice bunches of green dates of good size and promise. The leaves of these trees are much more erect than the last named, and are of a grayish color; fruit now one and one half to one and three quarters inches long.

In seeking for information to make this paper more interesting, I wrote to Hon. F. A. Kimball, who kindly responded, in part, as follows:

"During the month of October, 1890, I received a consignment of eight varieties of Arabian date plants, as follows: Two plants each of Amhat, Naklehel Pasha Sewah, Hazaneh, Geb el Abeel, Sutteneh, Ameuch, Rashiideh, and one male date. These plants were secured through United States Pomologist H. E. Van Deman, Washington, D. C., whose untiring industry has enriched California with many new and valuable plants.

"An extended correspondence with the department over which Professor Van Deman presides, resulted in an arrangement by which I was to receive the plants and distribute (to Southern Pacific Railroad Company in Arizona) one half of them, plant and take care of the other half, etc. All of these plants are doing well. I also received, October 10, 1891, from Professor Van Deman, one plant of the Fard date, which is represented to be the finest fruit of all the family, wonderfully productive, and an exceedingly beautiful tree—in color entirely different from all the others, being of a light bluish tint.

"Some of the varieties represented in the collection attain a height of sixty to eighty feet. The natural habitat of the date palm does not cover a great range of latitude—the north of Africa, the southwesterly and easterly portions of Asia. These, with India and the Canary Islands, embrace the more important countries from which the date is exported."

In religious celebrations the leaves of the palm are made use of by both Jews and Christians, and trees are planted for this purpose only in countries too cold to insure fruiting.

African dates as imported to our markets contain more than one half their weight of sugar.

As the product from the seeds of the date is so uncertain, and the expense so great to import the suckers, I think it will be many years before the date as an article of commerce will amount to much; but there are many places in this State where it would be well to experiment with it with a good hope of ultimate success.

PROCESS FOR COOKING DRIED APRICOTS.

By A. D. WILLIAMS, of Santa Paula.

I have been in the business of drying fruit for eighteen years, from 1873; I put eight years in Delaware, and the balance in this State. In the apricot I find there is a great deal of acid. At this meeting there has been no question raised in regard to the taste of sulphur

on the fruit. Now, sulphur will not taste on fruit properly cooked, and people throughout the East do not understand why this taste should exist, but it is simply because the fruit is not properly cooked. Some will soak it just a little while and then cook it in the water that it is soaked in. That may all be well enough with prunes, but for fruit that contains the acid that apricots do it will not do. I have been cooking apricots for the last few years by steaming them in an ordinary steamer over a pot of boiling water. Perhaps there are some in this audience who have done it the same way; they say there are a good many in California who do it in that way, but throughout the Eastern country, where the introduction of apricots should be looked after more, this manner of cooking fruits should be introduced, and it will have to be done by the State Board of Horticulture in this State in the same way.

This method is very simple. In the first place the fruit is scalded in hot water from six to eight minutes, and then left to soak in the water twenty-four hours, until the fruit has come to its natural size, and while the fruit is cooking make a syrup proportionate to the fruit you have.

The scalding process has a tendency to loosen the skin from the apricot, and after it is loosened you can peel it off very readily.

Scald the fruit first in hot water from six to eight minutes; then let it soak in cold water twenty-four hours, or until all fruit is its natural size before drying. Cook in a steamer over a pot of boiling water about ten minutes. When it is done put in a dish. While fruit is cooking make a syrup of sugar, with the usual amount of sugar it would take in proportion to amount of fruit. Pour syrup on fruit while hot; let stand until cold, when it is ready for use.

Apricots cooked in the above manner are equal to any canned goods put up.

JELLY-CURED CALIFORNIA APRICOTS.

This fruit is prepared in the orchards of California, by a system, the result of much careful experiment and expense, whereby the surplus of moisture is removed, the fruit, however, retaining all the rich, delicious flavor and nutriment of the natural state. It is sent East in bulk and the syrup added.

The care and cleanliness exercised in its preparation are equal in every respect to those used in packing the best canned goods, while the quality of the fruit is superior, in that it is picked fully ripe from the tree, possessing to its utmost the richness of flavor noted in all California fruits, while fruit for the standard canned is picked from three to five days before it is ripe, to stand transportation to the cannery.

Comparison of a 25-cent standard tin can of apricots with a quart of jelly-cured, in bulk, is as follows:

JELLY-CURED.	STANDARD CAN.
Sixty to seventy-five pieces fully matured fruits. About one half pound best granulated sugar. No glucose.	Twenty to twenty-five pieces, frequently hard and unripe fruit. A proportion of sugar, often largely glucose.
Actual weight of fruit and syrup, two and one half pounds.	Actual weight of can, fruit, and syrup, about two and a quarter pounds.

This fruit is sold in bulk (like oysters), by the quart or pint, by all grocers, at 25 cents per quart.

BULBOUS AND TUBEROUS ROOTED PLANTS.

By MRS. ELLWOOD COOPER, of Santa Barbara.

This class of plants do so well in California that it is a constant wonder to me that we do not have them in more abundance and in greater variety. They endure the long drought, and respond quickly to irrigation; and blooming as they do at different times throughout the year, flowers from one or another species of them can be counted on for nearly every month.

In *January* our gardens are enlivened by the Paper White Narcissus, and the low-growing, beautiful pink Oxalis, with its delicate yellow center, and they should be planted in masses, as they come at a time when flowers are scarce, and at a season when the ground and atmosphere are moist—conditions necessary to the family.

February brings us the Crocus. Of these the "Monster Yellow" is the best. It never fails to yield its bright yellow blooms. The early Jonquils, too, are out, making glad every lover of spring flowers. These should be had in such quantity that each garden could give a handful to enliven a dwelling whose inmates are not so fortunately situated as to grow them. Flowers, as gifts, have special value, for they excite emotions in the soul which tend always to promote higher and better thoughts. By them the rich are turned to the contemplation of the beautiful, the poor for the time being forget the strain of their labor, the sick and afflicted feel more lightly their distress, and the unfortunate prisoner feels awakening within him memories of his innocent childhood, which if kept aroused might reinstate him in his manhood. So carry these gifts everywhere—to the mansions of the wealthy, to the cottages of the poor, to the hospitals for the suffering, and to the prisons for the sin-burdened inmates. But while I am moralizing I am neglecting to notice the Freesias and Hyacinths along the borders, which make us know of their presence by the fragrance with which they fill the air around them.

March is ushered in with the various members of the gay Narcissus family. Too much cannot be said in praise of these beautiful garden flowers, of which there are several marked sections, which can be seen and studied in every florist's catalogue. They are all hardy and beautiful, and given good, sandy loam and a little covering of manure in the fall, will come up every year and give you in profusion of their sweetness and beauty. I would like to say much more about this classical plant, which I am glad to notice is coming to the front as a fashionable flower. May the fashion continue long, and may we see as much interest taken in the Narcissus as in the Chrysanthemum.

But I must hurry away to other beauties waiting to be noticed. Sparaxis, Hyacinths, Tritelias, Lachenalias, Oxalis lutea are on every side shining in the warm sunlight, lighting up the walks with such beauty as to make staying indoors impossible. Much could be said of each and all of these, but I lingered so long among the Daffodils that *April* is here upon me, and I must hasten to call your attention to the Anemones and Ranunculuses, with their lively and various hues. Hosts of other beautiful flowers are keeping them company, making this month also a time of delight: Ornithogalums, Richardias, Irises, Ixias, Oxalis florabunda, both pink and white, Tulips, especially Tulipa gesneria, because it adapts itself to the climate, or rather to the season. Many

of last month's flowers are still fresh and bright. This being the month when so many bulbs are in bloom, care should be taken to have all the conditions necessary for the best results.

With *May* comes the more showy flowering bulbs. Amaryllises of various kinds, with their many hybrids all fine in coloring, Lilium longiflorum, and Harissii are in perfection. The Cannas, too, are showing out their gay colors. We do not have as many of these fine flowering bulbs as we should, seeing they do so well in the open ground, and are increased so readily by offsets, as well as by seeds, in which they are so prolific.

In *June* we have the so-called summer bulbs: Agapanthes, both blue and white, and there is a variegated-leaved one with blue flowers, useful among decorative foliage plants; Amaryllis aulica, majestic in size, gorgeous in color, well named "Lily of the Palace," here it might be found in every cottage garden; Hemerocallis fulva, with its orange-colored flowers; Lilium humboldtii and Lilium candidum, the sweetest and purest in color of all the lilies; Tritonias, in brilliant orange and other colors; Alstromerias gladiolas, and the stately Tritonia nobilis, with its flame-colored spikes on stems eight or ten feet high, especially fine for sub-tropical gardening.

July opens with another fine Amaryllis, the beautiful pink Belladonna, with its fine clusters of bloom. It has the first rank among the bulbs of this month, and it is well set off with Chinums of different kinds, and the nearly allied Pancratiums. Both of these groups have curious white, sweet-scented flowers, which look well among their luxuriant foliage. Near them are seen the Zephyranthes, lovely, bright little things, some pink and some white. Then the Hemerocallis flava, sometimes called the Yellow Lily, adds much by its color to this collection. Dahlias, too, are in bloom now, among strong-growing plants.

And now comes *August* to give us the Vallota or Scarborough lily, the Nerines or Guernsey lilies, Sternbergias, Colchicums or Fall Crocus; choice, every one of them, and of easiest culture, which a little experience soon teaches.

September bloom is a continuation of the preceding month, with the addition of a later variety of the Amaryllis belladonna, and even more beautiful than the July one. Dahlias and Cannas are of first importance now.

October, November, and December are not altogether deprived of interest as regards blooming bulbs, for the rare Veltheimia, with its spikes of pleasing pink flowers a foot or more in height, continues for months to brighten the border, and Imantophyllum miniatum, with its Pompeian red clusters set in its dark green leaves, is an effective plant, and Amaryllis aulica gives many an occasional bloom during these months. Some of the Hæmanthus, too, in sheltered places will send up their spikes of red.

This summary of blooming bulbs is made up from notes written down in a garden book from month to month during this year. It shows what can be done with bulbs therein mentioned. Many other interesting and beautiful plants of this class would thrive well here, and should be introduced. They might be somewhat expensive at first, but when once established in this State, so favorable on account of its soil and climate to many plants that in places less favored have to be grown in pots inside, thereby hindering the more rapid propagation which free soil

and genial atmosphere would favor, they would soon become more plentiful and cheaper.

I have sometimes thought that if our wealthy citizens of leisure, when traveling in foreign lands, would bring on their return some of the choice and rare plants which came under their notice, and give them into the hands of skillful and careful gardeners to propagate and introduce, it would benefit us greatly. In this way England has filled her gardens from all parts of the globe, her citizens abroad taking pride in obtaining and sending home new plants to enrich her collection.

Bulbs are so easily transported that we might in a short time have a much greater variety. But the bulbous plants of our own State are not seen in many gardens, and we have many growing in different localities. Alliums, Bloomeria, Brodiaeas, Brevoortia, Liliumstritillarias, Erythroniums, Calochortus, Trilliums are all valuable and desirable, and if once introduced and established would become residents of the soil.

There are many interesting things in this class of plants that I have not referred to, which should be noticed, but mention of all would enlarge my paper beyond the limits of its design. I would like to see an essay confined to Lilies proper from the pen of some one thoroughly experienced in the growth of every one of them, giving the minor details of their culture. I am told that Lilies are grown very successfully in kerosene cans sunk in the ground, with holes punched in the bottom to secure good drainage, and filled first with broken rock and coarse gravel three or four inches deep, and above this good soil mixed with leaf mold. Lilies do not like manure, but thrive well in leaf mold.

Begonias I have not touched upon, and they are now a very important part of the flower garden. I refer, of course, to the tuberous-rooted kinds. I have not been able to give them much attention as yet, but mean to do so.

Brief mention must be made of the Water Lily garden that gives us, among other lovely things, the Sacred Lotus of Egypt, long regarded by every one as the most beautiful of all Lilies. Since Mr. Sturtevant has shown us how easily it can be grown, there is no reason why every one should not look upon its wonderful loveliness. An additional interest has been added to this plant by the issuing of Professor Goodyear's "Grammar of the Lotus," proving that it has been "the basis of most of the ornamental patterns of Greek and later times."

A Water Lily garden is another beautiful study of nature brought within the reach of all who take pleasure in plant life. As we walk in our gardens among the Lilies we are reminded of the great teachers of the past. First of Homer, who, twenty-five hundred years ago, said of the Asphodel, that it grew in the flowering meadows of Elysium, on which only the pure in heart were allowed to tread. The Daffodils call to mind the grand works of Shakespeare: "They come before the swallow dares, and take the winds of March with beauty." But greatest of all are the words of the Master: "Consider the Lilies of the field how they grow; they toil not neither do they spin, and yet I say unto you, that Solomon in all his glory was not arrayed like one of these."

SMALL FRUITS.

By MRS. L. U. McCANN, of Santa Cruz.

I belong to the vanguard of the great army of women whom the evolution of the age has freed from many a cumbersome care, and who look up to the wide open doors of horticulture for possibilities undreamed of by their mothers; therefore, I make a plea for women in your horticultural meetings, and I stand to-day in good and regular standing as a regular nurseryman and horticulturist, whose name is enrolled upon your books. [Applause.]

Nearly twenty-five years ago I became owner of a few acres of California soil. My first thought was, looking back to my old childhood home, Oh, what a raspberry patch or strawberry patch I will have! My name was not on the list of every nurseryman, and I thought, to secure my fruit, I would have to simply ride out to some farmer's wife and say: "I would like to buy some strawberry and raspberry plants." I had a very intelligent woman who brought me butter week after week, so I thought, without doubt, I should find a supply. I rode out to her husband's ranch and I told him I felt as though I would like to get some strawberry, or blackberry, or raspberry plants; have you any to spare? "My child," he said, "you ain't been long in this air country." His wife said: "I have been trying," and the tears came into her eyes, "ever since I have been living here on this old ranch, to get my husband to put in some small fruits. I told him that my girls would do all the picking if he would only give us the start; and many times when he would be heated and tired so that he couldn't eat his pork and beans, that if I had a nice dish of raspberries or strawberries, something cool and fresh with cream, he would have a relish for his whole dinner afterwards, and would have been a better man for the whole week." [Applause.] But he said: "No; we can buy them cheaper;" and the result is the miserably dried-up things they get in the market, maybe once or twice a year, which are all the berries that are seen.

Gentlemen and farmers and fruit growers, if this shoe pinches any of you, I hope it will pinch so hard that you will go home and plant some berries. [Applause.] I think most of the guess-work concerning the culture of small fruits would be done away with if you understood, once for all, that they are perennials, or biennials rather. That means the plant which sends the young shoot up with the first spring rain, grows that fruit one year, bears fruit upon that young sucker the next year, and at the end of that season has done its work, and must be cut down to make way for its successor. Hence, the knowledge of this fact gives us the process of pruning in berry culture, and, with very few exceptions, these plants are renewed by the Wise Providence who plans for the perpetuation of all good things to renew themselves by suckers springing from the root of the old plant, so that by the time the bearing cane is ready to be cut and burned, the successors are also ready to take their place. The only difficulty is that these newcomers must be thinned and taken away so as not to take away the strength of those remaining. This is true of the blackberries of the red and yellow varieties, with a few exceptions, and yet if you do not know that exception, and trim the black raspberry in the same fashion, you would cut yourself off from further fruit, and "kill the goose that lays the golden egg." When I have talked with people about the cultivation of black-

berries, they have said: "Oh, I have tried them once; they ain't any good for California; I have trimmed them in the fall, and that was the end of them; I never heard anything more of them afterwards, so I gave them up." I said: "You trimmed them in the fall, did you?" "Yes." "If you had noticed or known that there were tap-roots, you would have given it a little more thought; if you had noticed closely, as you should to be a successful horticulturist, that these young, tender, green branches were seeking the earth, that they knew what they were about, and went there for a purpose, you would have found a root-formation on the top, telling you what their intent was, and if you had made the study of the plant, you would find how easy it is, knowing what the nature of the plant is, to carry on its cultivation." In my own garden they are grown in rows, and I keep them about four feet apart, and when these young tendrils go down, they are taken and divided, the ground is loosened between the berries, and from both sides of the bush these tendrils are gathered together, a shovelful of earth thrown on them, being careful to keep them exactly in the line, which holds down these tendrils, and which keeps the shifting winds from breaking the tender roots, and when they are ready to take their positions as successors to the old plant, you can cut the old plant away on either side, and still have your plants four feet apart. Blackberries are also biennials, needing the old canes to be taken away, as the raspberries are, and then you must select your strongest and best successors after taking out the weak and unthrifty.

With regard to the after-growth of plants, much may be accomplished in your daily walk through the garden. The process of pruning is so simple that he who understands the nature of any plant may soon learn how much he may assist them as he walks through his garden. When the young raspberry shoot has gotten to be about eighteen inches above the ground, I pinch the tender top of it as I walk through my garden. By this process of pinching you start the laterals, and make the stalk grow firm and strong, and you have three, four, and six branches instead of one heavy one, and if they grow too thin I cut them back again. With blackberries, and with all other varieties you can do the same. I repeat, by this process of pinching the young or tender plant, you need do no heavy pruning beyond that, and the earlier I do this the stouter the plant is. There is but one caution: do not do your pruning so late in the fall—I am speaking particularly of my own locality, where we have no frost—as to produce a growth of wood that will be too new and tender to resist what slight frost you may have. To my mind there is a large plot of country lying between the top of the Coast Range down to the sea that is especially adapted to small fruit culture.

The processes of pruning and planting are very simple. In my own grounds, seeing that labor is the heaviest cost in planting or cultivating my garden, everything is done by horse-power, and the distance apart is just sufficient to let a single-horse cultivator go back and forth, if necessary, through the season, so as by cultivation to keep the ground loose and to allow the carrying of manure and other fertilizers, which is hauled on a sled that can run between the rows and facilitates the work.

Of course, you well know that strawberry culture is somewhat different from other plants, and if you are a wise student of nature the very fact of the production of so many runners will tell you that this

plant is a voracious feeder, and seeking forever new ground in which to plant its roots; therefore, keep your ground rich, and in the commencement of the season keep off these runners by continual clipping, if you do not want to exhaust your plant and cut short its fruit-producing power.

There is much to learn about strawberry culture. I learned it as most of us do, more from my mistakes than my successes. I am a careful nurseryman about keeping my plants distinct, and carefully labeled, so that the varieties may not be mixed. I had an old bed dug up and put under the finest cultivation that I knew how to give them, so as to be ready for my thousand new plants, which were a great expense to me. I think I had to do without a Sunday bonnet and a pair of gloves, or go without those thousand plants. I put them all to one side in this new bed. They grew very nicely, but they did not bear one single ripe berry. I learned the next season what that meant, as I found every last one of the thousand to be male plants, and it is not good for even a male strawberry to be alone.

Perhaps it might be interesting to tell you my experience with new fruits. I have in my ground a raspberry, called the Logan. This is hybridized by standing between a red raspberry and a wild blackberry, which gives a beautiful fruit almost an inch and a half long by an inch wide, of rich raspberry color. I have also hybridized a strawberry, which I should have called the "Great California," or the "Great Western," or the "Great Pacific," if all those names had not been taken by small and insignificant plants, and so I named my berry "The Tap-root," because it had a tap-root three feet long. I do not think that any other strawberry can compete with it. This year I have given it the severest test that I know of. I have placed it in my "experiment bed," for I believe it will solve the question of strawberries in places where there is no possibility for irrigation, and I wished to see how long it would do without water. I planted them in my experiment bed in single departments, and also planted others that were said to endure drought, and gave orders to my gardener that not one drop of water must go to that bed. Suicidal, perhaps, but I wished to test the very fullest power of this plant to live over the dry season, and to-day not one single strawberry out of the whole fifty planted there has died. The leaf has grown smaller, but life is still there, and it sends its deep tap-root down where it finds enough to live upon. I am still experimenting with it.

HOW TO PLANT A RAISIN VINEYARD.

By P. W. BUTLER, of Penryn.

Details of the latest method of making a vineyard are here given for the benefit of those who are about to engage in the industry of raisin making.

As the land must be irrigated, if it is not sufficiently level it must be made so that water may reach every part of it by flowing through open ditches. The ridges or knolls to be leveled can be plowed with two horses, one man driving the team and holding the plow. With four horses, and a scraper five feet wide, one man can do the leveling.

Levees can be built to conduct water to ridges at less expense, generally,

than ridges can be leveled. All levees should be made higher than the average ditch, with strong banks to insure against expensive breakings.

Distributing ditches and cross ditches should be made at distances not more than three hundred feet apart, to run the water to furrows that may be five to six feet apart. These furrows can be made with a plow and two horses, handled by one man.

In the main ditches from one to two headgates must be placed to each forty acres of land, so that the water may be properly controlled. The land is then ready for flooding. In all new ditches it is safer to flood before planting, as the ground often absorbs an immense quantity of water and settles unevenly. The land should be flooded from twelve to twenty-four hours, or until it is thoroughly well saturated; but more water should be given to the higher than the lower portions, and the lowest parts need have no water, as they will get plenty through percolation, and ditches need not be extended to such places.

After flooding the land should be again leveled before plowing. A leveling instrument should be used in surveying all main ditches.

Small ditches can be made by plowing with two horses, and then with a V and four horses the soil is thrown up at each side, and the process repeated until the ditches are sufficiently large. The scraper must be used in making the larger ditches.

It is well to have the first leveling done and main ditches made before the fall rains, as the soil is then dry and much lighter to handle than after it becomes wet. Bridges that are to cross ditches and all buildings should be made before the autumn rains.

Hay and grain for the use of horses should be bought during their harvesting, and taken direct from the field and stored where they are to be used.

Have constantly in stock extra fittings for all implements, that repairs may be made without loss of time; and such as are liable to be needed should be taken to the field each day. Have printed rules to govern labor of all kinds, and have them signed by all parties as employed. Hire men and horses at stated prices per day, when at work, and charge them board for each and every day, including Sundays.

A stake should be set by each vine as planted. They can be cheaply made from redwood posts four by six inches and seven feet long, that are sound and free from knots. Cut into blocks fourteen inches long, making six to each post. With a hand ax and maul split these blocks into squares of one third of an inch, or nine stakes to the square inch. Each post will then make about twelve hundred stakes, and six thousand can be made in a day by one man. These should be whitewashed, that they may be readily seen when plowing for irrigating and cultivating, before the foliage starts on the vine. This can be rapidly done by filling a bucket with whitewash, then grasp as many stakes as can be held in both hands and dip half their length in the wash, and spread in rows that they may dry quickly, as they will be much whiter than when dried slowly.

The land should be plowed not less than one foot deep. This can be done with a single plow drawn by four horses, or three horses, if they are large—one man to both drive and hold the plow.

If the ground is heavy it will be necessary to harrow it at once, and when lumpy it should be harrowed the second time. Smooth with a drag sixteen feet wide. This can be made of four planks one inch thick,

twelve inches wide, and sixteen feet long, nailed to four pieces of two by four-inch scantling four and one half feet long. Lap the plank one inch as nailed, bevel the ends of the joists, and nail another plank on the beveled ends, thus making a sled that will slide over the dirt without loading. This can be drawn by four horses, and will smooth the surface so the line will lie evenly on the ground as the planting is done. The planter should take the vines in the nursery, if possible, and have them dug under his own supervision, and only a few days before they are to be planted. Have them covered and wet as fast as dug. An ordinary hay wagon with a broad, closely-boarded platform, is a good vehicle in which to take them to the vineyard. Cover the platform with straw, then load the vines carefully, so as not to bruise or break the roots, with the tops on the outside. After loading, wet them thoroughly, and cover closely with canvas, binding it around the sides and ends to exclude the wind, and while in transit wet the canvas as often as it shows signs of becoming dry. Leave them at the vineyard at convenient places for distribution, near the water ditches. Now, get some old oil barrels, saw them in the middle to make tubs. Let each pruner take one of these tubs, into which put a few inches of water, and as each vine is pruned place the roots in the tub of water until full, when they can be taken to the planters or again heeled in the ground. Let the pruner take only one bundle of vines from the ground at a time, and sprinkle them if necessary, keeping them shaded while cutting, and not exposed to the wind. Cut off all the branches except the strongest one. Leave a spur of that one to two inches long that has one or two buds. The straggling roots that may be growing on the upper end of the vine may be removed, leaving only the roots at the lower end. These are to be clipped, leaving a length of four to six inches on the longest roots, but the smaller roots may be cut closer. The ends of all bruised roots must be cut inside of the part bruised. Positively reject all vines that have black-knot, or are bruised on the main stock, or have weak roots, or in any way show signs of being unhealthy, or that may by accident or otherwise have become dry after being taken from the nursery.

The vines can be hauled in tubs on sleds to the planters, the tubs having in them a few inches of water, in which the roots are set, and then put direct in the bucket of each planter, which also contains water, and the vine is taken from this bucket only as it is planted.

Vines must always be kept moist from the time they are taken from the ground in the nursery until planted in the vineyard. The popular distance apart at which vines are now planted is eight by twelve feet, or ten by ten feet. I prefer, however, to plant in equilateral triangles eleven and one half feet apart, which gives the same number per acre as squares of ten feet. I use lines composed of seven-strand galvanized cable wire of about one fourth inch in diameter and three hundred feet long. A stake is attached to each end of the line, made of gas pipe one and one half inches in diameter and two feet long, pointed at the end. Open the strands of the line two and one half feet from the end, insert a fine brass wire and wind it several times around the line and securely fasten. At the distance at which it is desired to have the vines planted apart this is repeated until the line is filled with the marks. Two lines are used in planting. After one line is set by two men the second line is set by the same men while the vines are being planted on the first line, and when done the line is thrown over the other and the men step

forward to plant, without losing time while the line is being set, as is the case when only one line is used.

By this method, I have for many days in succession planted forty acres per day with one crew of twenty-six men—nineteen men to plant two vines each on the line, two men and two teams to haul the vines in tubs to the planters, two men to distribute them to the buckets of the men, and one man to watch the work to see that every vine is honestly planted.

For a small vineyard less men are needed. The first row of vines should be planted about one rod from the fence, to give room to turn teams in cultivating.

Fences should be built immediately after planting, if not before. It is not necessary to fence against stock in the San Joaquin Valley, but hares must be kept from the vineyard. Redwood posts two by two inches, four feet long, driven in the ground ten inches, and set ten feet apart, to which attach wire netting three feet wide, makes a cheap and effective hare-proof fence.

Plow two furrows on each side of the fence, and then with a V turn up the soil against the netting, when the ground is *wet*, to a height of about six inches; it will then dry hard, and the hares will not burrow under it.

It is not absolutely necessary to irrigate immediately after planting, if done in the early season, and the land has been well flooded before plowing; but if the ground is at all dry, irrigation should follow at once. By plowing one furrow close to the vines, and filling it with water, it will percolate through the loose soil to the vine just planted, and thoroughly settle it around the roots; it will then grow with absolute certainty if the soil is ever after well cultivated, and not allowed to become too dry.

After the rains cease in the spring, irrigate once a month until September, to insure the best growth of vine. Plow deep furrows ten inches from the row of vines on each side, throwing the soil from the vine, then fill with water, but not to overflow or run outside of the furrows, and keep them filled for several hours, that the ground may become well saturated by percolation, but not wet on the surface outside of the furrows, or cultivation will be more difficult. In about two days, or as soon as the ground becomes sufficiently dry, turn the furrows back with a one-horse plow, and at once cultivate across the furrows and again at right angles. Hoe around the vines at the same time, thoroughly pulverizing the soil to a good depth. Borders of trees are now usually planted around vineyards. Olives, figs, or other fruit or nut trees are preferable to trees from which no income can be derived. These can be planted eighteen inches from the fence on the inside, in the edge of the bank thrown up against the fence; they can then be irrigated by water run along the gutter at the edge of the fence bank.

If suitable land is selected and planted according to the rules here given, the vines will make a completely satisfactory growth without loss, except by accident.

REPORT OF COMMITTEE.

MR. STABLER: Your committee to whom was referred the matter of affiliation with the Traffic Association, begs leave to report as follows:

To the Fruit Growers' Convention of the State of California:

Your committee to whom was referred the matter of affiliation with the "Traffic Association of California," would respectfully report that they met, and after a careful deliberation of the subject, recommend that this Convention urge upon its members and all fruit growers and shippers in this State the necessity of using their utmost endeavors to cause to be organized in their respective counties local Traffic Associations, to the end that said local Traffic Associations obtain a representation in said "Traffic Association of California," to act in concert with it, for the general benefit of the producing, manufacturing, and shipping interests of this State.

S. J. STABLER,
B. F. WALTON,
W. H. AIKEN,
Committee.

Adopted.

RESOLUTION.

MR. ALLEN, of San José, introduced the following resolution:

WHEREAS, The terms of office of the several members of the State Board of Horticulture have expired; and whereas, no appointments have been made by the Governor to fill those vacancies; therefore, be it

Resolved, That the fruit growers of the State of California, in annual Convention assembled, most earnestly and respectfully request that his Excellency Governor Markham reappoint the members whose terms of office have just expired.

MR. BUCK: I will only say, in a few words, that the State Board of Horticulture has been doing and is doing some good work, and the evidence of it is the attendance we have had at this hall from the time we rapped and called this Convention to order, on the 17th instant, till the present time. There have been no politics in the present Board, nor have there been since I have been in it. Whether all the members of the present Board are the best men that could be selected in the State I am not able to say, but I believe that they have done work that the horticulturists of this State are satisfied with, and I believe that their work has shown that the money intrusted to their care has been well spent, and not wasted, and for that reason I would ask you to indorse this resolution.

MR. ALLEN: Mr. President, I want to say that it needs only to be said that the members whose terms of office have expired comprise the names of Ellwood Cooper, Mr. Block, and of three others from whom we have always heard with pleasure and greatest profit.

MR. BUCK: I will state that the members of the Board whose terms of office have expired are Mr. Cooper, Mr. Thomas, Mr. Block, Mr. Runyon, and Mr. Mosher.

Resolution adopted unanimously.

COMMITTEE.

The President appointed C. H. Allen, of San José, R. B. Blowers, of Woodland, and Wm. Johnston, of Courtland.

REPORT OF COMMITTEE ON RESOLUTIONS.

MR. BRAINARD: The Committee on Resolutions begs to report as follows:

WHEREAS, The voice of every attendant at the present State Fruit Growers' Convention, held under the auspices of the State Board of Horticulture at Marysville, November 17-20, 1891, has been an expression of a feeling of agreeable satisfaction; that the same has in every way been pleasant, interesting, and profitable; and this measure of abundant success is in a large share due to the friendly, hospitable, and earnest coöperation of the citizens of Yuba and Sutter Counties to make it so; therefore, be it

Resolved, That this Convention would fall far short of duty if it should fail to place upon its records its full appreciation of these kindly efforts, so admirably planned and so enthusiastically carried out by the horticulturists and citizens of this locality; and be it further

Resolved, That the comfortable and homelike feeling engendered in every heart by the respectful and unostentatious reception, attention, and hospitality received at the hands of the good people of these two counties on whose borders we meet, has been a grand factor in making the sessions of the Convention so harmonious, so eminently practical and instructive to all who have been present; and be it further

Resolved, That, in view of all this, and the pleasant excursions planned to enable the visiting members to learn by practical observations in the orchards some of the methods practiced by horticulturists in this highly favored section, this Convention express to the people of Yuba and Sutter Counties, and in particular to those in the vicinity of Marysville and Yuba City, their obligations to them for these highly important favors, and to the committee having all the details in charge its earnest thanks, with the assurance that nothing has been lacking on their part to make this session of this Convention the perfectly successful one it has proved to be.

HENRY A. BRAINARD,
FRANK A. KIMBALL,
A. P. CRANE,
Committee.

Adopted.

RESOLUTION.

MR. McGLINCY offered the following:

Resolved, That a vote of thanks be tendered to the proprietors and publishers of the newspapers for the very extensive reports they have given of this Convention.

Adopted.

REPORT OF THE COMMITTEE ON EXHIBITS.

MR. PRESIDENT: Your Committee on the Exhibition began its labors at the close of the Convention this afternoon with the intention of examining such exhibit and reporting candidly upon its merits. But the extent of the exhibition, the variety of fruit displayed, and the number of exhibitors forbade, within the time to which we were limited, doing even partial justice to the matter. We concluded, therefore, to content ourselves with calling attention to the striking features of the exhibition.

We first desire to express our thanks, and the thanks of the Convention, to the generous and public-spirited gentlemen who so kindly contributed to the pleasure and information of the members of this Convention. There were fruits displayed which, for color, size, and freedom from the attacks of insects, are worthy of praise. The curing of the fruits, especially certain samples of dried fruit, prunes, and figs, seemed the acme of perfection.

The exhibition, apart from the excellence and flavor and perfection of form of the fruits, is most worthy of notice as an exponent of the climate of the State. Remember that this is the twentieth of November, and yet there were ripe oranges, pomegranates, persimmons, apples, a dozen varieties of table grapes, including the Thompson's Seedless, pears, quinces, and peaches, and many varieties of vegetables, and last, though not least, olive oil from San Diego County. Where in any land under the sun, save in California, could such a various collection of fruits and vegetables, at this season, be produced?

Whatever is new in California in the process of curing fruits and packing them in an artistic and tempting style should be noticed, and hence we beg to call attention to the collection of Mr. Mosher of fancy dried or semi-preserved fruits. They approach in appearance and elegant mode of packing the style which, heretofore, has made the French preparations so famous. We noticed in other samples prepared, we are informed, for the market, laudable attempts to ornament the fruit and packages.

Mr. Kimball exhibits bottles of virgin olive oil. This oil was sampled by the committee, and we pronounced that it has no superior; it is bland in taste, perfectly filtered, and of delicate flavor.

From the valleys to mountain altitudes of two thousand eight hundred feet above the sea, were gathered these fruits. Mr. Meek, of Camptonville, two thousand eight hundred feet above the sea, exhibited apples, pears, English walnuts, almonds, hickory and butternuts. He also exhibited a new apple, the Louvre, which is worthy of examination by apple growers. It is one of the handsomest of apples, and is said to keep two years. Especially do the apples from Humboldt County challenge admiration for their intense color and perfect form.

Among seedlings there are almonds, oranges, and apples. Three mechanical inventions were presented, which to the committee seem perfection, judging by the work performed. One is an almond budder, for budding stick-fast almonds. Another is a pitting machine, called the "Freeman Fruit Pitter." Another is an invention to perform an operation which seemed hitherto to be impossible of performance.

It takes a clingstone peach, cuts it clean in half, and extracts the seed, without leaving any ragged edges or torn center.

It is to be regretted that time would not permit a catalogue, for permanent preservation, of the names of the contributors and the products exhibited, as so much seemed due to the exhibitors as a testimonial of our appreciation of their consideration for and entertainment of the Convention.

Respectfully submitted.

E. W. MASLIN,
R. B. BLOWERS,
LEONARD COATES,
Committee.

Adopted.

NEXT PLACE OF MEETING.

A letter from the Board of Trade of Visalia was read, inviting the Convention to hold its next session at Visalia. Also, telegrams were read from the Board of Trade and Chamber of Commerce of San José, inviting the Convention to hold its next session at San José.

MR. CLAYTON: I wish to place the name of San José in nomination. We will try and make your visit as pleasant as it has been here, even more so, because we have all the facilities for accommodation. It has been a long time since the Convention has met there—some nine or ten years—and the citizens feel that they ought to have a meeting there. If you select that place I am sure you will not regret it.

MR. ALLEN seconded the nomination of San José.

MR. MOTHERAL: I nominate Visalia.

MR. CAMPTON: I should like to see the Convention held in San José. It is a delightful place, plenty of room, and good roads.

MR. BUCK: I believe I voice the sentiment of the State Board of Horticulture when I say that it is not what we do for ourselves particularly, but what is for the benefit of those living in and around the sections where the meetings are held. Whatever place we select for the place of our next meeting, I hope we will have a generous attendance there.

MR. WAGNER: We have a little village in Nevada County—Grass Valley—of over seven thousand inhabitants, and I believe we could treat the next Convention with as much courtesy as any county in the State. I want to tell this Convention that it gives me pleasure to meet with you, and I appreciate your united efforts to promote the fruit industry, and I believe that Nevada County is fast coming to the front rank in this line, if T. J. Wagner of that county does say so. [Applause.] I feel it is an industry that is waking up faster in that county than in any other county in this State, and therefore I believe it needs some encouragement. I would like every man in this Convention and every lady to be in Grass Valley at the next Convention, if you decide to have it there.

MR. THOMAS: I withdraw the application of Visalia in favor of Grass Valley.

MR. BUCK: I will put the motion: first, that this meeting recommend that the next Convention be held at Grass Valley. Now, remember, those of you who vote "yea" in this case vote to carry this meeting to Grass Valley.

Lost.

MR. BUCK (proceeding): Now, as there is no other place named, all in favor of San José signify it by saying "yea."

Carried unanimously.

COLUMBIAN WORLD'S FAIR.

By GEORGE HUSMANN, of Napa.

Will California be represented at the World's Exposition? You may think this an idle question in a State which was the first to take initial steps and has made a fair, though hardly large enough, appropriation towards making a display. But I have been looking on, and I may say here, that although a comparatively young Californian, living here in our glorious State only ten years, that none of you can surpass me in love for it, in appreciation of its great future, and in admiration of its great resources, surpassed, if even equaled, by none in the bright galaxy of States which Americans proudly call "our country." I firmly believe that Providence has destined us to be the greatest State in the Union, "the land where wine, milk, and honey flow," the Italy of "our country," which our great German poet, Goethe, seems to have had in his mind when he sang in his "longing for Italy:"

"Know'st thou the land where fragrant lemons bloom,
In cooling shade the golden orange glows;
Where tempered breezes blow from azure skies,
The myrtle low, and high the laurel rise."

But because I fully appreciate it I do not want to see a second class display. If we cannot surpass every other State in making a grander show, in doing justice to our capabilities, we had better stay at home altogether. I intend to go to that exposition, but if California cannot outstrip all competitors, I would not own that I am one of its citizens. If we make an exhibition at all, it must be one which will excel all others. We can do so, but will we do it? I fear not. There have been too many bickerings, too many local jealousies already. If this had not been the case the Superintendent of the Horticultural Department would have been a Californian. Newspaper men, however competent they may be to make a great newspaper, are not the best representatives of a great agricultural and horticultural State, because they are without that practical knowledge which alone enables them to judge of its vast resources. The rare plants from the countless localities which lie hidden in its mountain dells and cañons, if collected by a botanist, a man or woman, either, would form one of the most attractive features of the exhibit. The fauna and flora of our valleys and mountains, if properly collected and arranged, would be a revelation to the people of the Eastern States of which they had not dreamed, and which would be the father of the thought, "Let us go and see for ourselves and make this State our home."

It has well been called the golden opportunity for our State, and if we neglect to improve it, if we do not outshine all the other States, we had better stay away. We can easily excel, for where can you find a climate where the apple and pear, peach and apricot, plum and nectarine, cherry, quince, and grape, as well as all the small fruits, can be grown in one orchard, together with the fig and almond, walnut and olive, orange and lemon; where the fruits of the northern zone will flourish equally well with those of the tropics; where there is not a day in summer or winter but a bouquet may be culled from any garden fit to grace the table of a king. To you, who were born in this incomparable State, who have been familiar with it from your earliest childhood, this may not appear so wonderful as to those who, like myself, grew up in a colder clime, and we appreciate it, therefore, all the more. So will the

thousands who flock to this great exposition, and who have never seen California.

I have urged you once before, as agent for the department on a similar occasion, to contribute exhibits to the Paris Exposition. I am sorry to say that but few responded to my call, although I had several promises. Yet the meager exhibition we had at Paris resulted in the award of about fifty medals and diplomas for the State, and has attracted French experts to this State to examine its viticultural resources. One of the consequences has been a large order for our clarets (fifty thousand gallons) from France, and also orders for wines and brandies from England and Germany, which promise to amount to a million gallons within twelve months.

This is a home exhibit, so to say. We want to show to the world that America is the greatest, the most varied, the richest country on the globe. But we, as Californians, also ought to prove to them that we are the greatest State in the Union. Let the grain farmer bring his grain, the stock men a full representation of our noble herds, the mineral resources of the State be fully shown. And need I tell you, horticulturists of the State, what you can and ought to do? No State can claim such varied and excellent productions in your special line. You have the fruits, the vegetables, the flowers to make the greatest show on earth, but every one must furnish his best, and work with a will. We want united action; we want a continuous supply of fresh fruits, vegetables, and flowers during the entire duration of the exhibition, and to do this we want organized efforts.

Let me hope that such steps will be taken at this meeting as will secure a worthy representation, such as we may all be proud of. How this is to be done is for you to say, for in multitude of counsel there is wisdom. We cannot afford to lose this golden opportunity by small jealousies and bickerings. Let us work with a will, and altogether, remembering that great axiom, that the general welfare of the community is also the welfare of the individual.

LETTER FROM GENERAL CHIPMAN.

RED BLUFF, CAL., November 19, 1891.

B. M. LELONG, Esq., Secretary State Board of Horticulture, Marysville, Cal.:

DEAR SIR: I am greatly disappointed to find myself so tied up in Court that I must forego the pleasure of meeting the Convention, and sharing the benefits which always come to those who attend.

You have many very interesting questions before you which I had hoped to hear discussed; but there is one I beg especially to urge, and that is, the necessity for a careful and intelligent republication of your proceedings from the earliest date of your meetings. There is great need for practical information upon fruit growing, and although Professor Wickson, in his "California Fruits," has done the State great service, as have you and others, in the preparation of valuable monographs upon individual topics, there is yet a mass of excellent material in your reports that cannot reach the general public, and is of the highest value. They should be edited, of course, with a view to sifting the wheat from the chaff, and giving the more important practical matter contained in them.

I sincerely hope this question will not be overlooked or postponed. The future greatness of California must rest largely with her growers of fruit trees and vines.

The fact that the value of fruit and wine exports for 1890 excelled in value our wheat exports, has placed the industry, of which the members of your Convention are among the most intelligent exponents, foremost in the State.

The results of your deliberations ought not to be hidden under a bushel. It is due to yourselves and to the noble calling for which you are working, to spread broadcast all possible information relating to fruit growing.

Wishing the Convention a most profitable session, I remain, sincerely yours,

N. P. CHIPMAN.

RESOLUTION.

MR. AIKEN offered the following:

Resolved, That we approve of and recommend the formation of County World's Fair Associations.

Adopted.

Recess was then taken until Friday evening.

EVENING SESSION.

FRIDAY, November 20, 1891.

Convention called to order at 7 o'clock P. M.

Acting President Buck in the chair.

THE LEMON INDUSTRY.

By O. P. CHUBB, of San Bernardino.

It is evident that the citrus industry, in the direction of lemon growing, is receiving a new impetus in the southern portion of this State; in fact there are strong indications of a boom in that line, and the question arises, is it expedient for orchardists to enter upon that branch of the fruit industry as a specialty, where the local conditions are favorable?

As a general proposition it would seem reasonable that the American market, at least, ought to belong to Americans; and since we have successfully competed with foreign production in other lines of fruit, may we not confidently now enter the lists in supplying our own people with so staple a product as prime lemons? Current statistics show that importations of this fruit are very steadily, if not rapidly, on the increase; and that its consumption is more than keeping pace with our ratio of growth in population. If California can furnish American markets with a quality of lemons equal in all respects to those received from Sicily, wherein lies the good sense of yielding so profitable a trade to that country?

Granting the premise as to quality, it becomes a matter of option with us whether the \$4,000,000 or \$5,000,000 annually paid by the people of this country for foreign lemons shall hereafter be retained for the benefit of American labor and home production. The problem to be solved then is, whether our growers can profitably produce, cure, pack, and put upon the market, when the demand is greatest, such fruit as will, if offered at a lesser price, and in sufficient quantity, wholly replace the imported article. It is hardly plausible that quality and condition will alone insure such a result, since past experience has begotten a prejudice among American dealers in favor of the foreign product; and only such concessions in prices as may appeal to their individual interests will enlist their coöperation. A carload of California lemons put upon the New York market in July—sampling equally well with a cargo fresh from the Mediterranean—must yet, by practical test, show that it will stand up as long in the retailers' hands, and the risk will not be assumed without some material inducement.

It is not a great while since San Francisco dealers were disposed to offer a relatively fair price for a certain few brands of California lemons, bearing the marks of intelligent and careful handling. And therein lies the secret of the whole business—of properly curing so as to compel the attention of dealers, whether they are actuated by State pride or otherwise. It is, moreover, the key to the situation in regard to the future entire control of the American market, not to mention others outside. When the Nicaragua Canal is completed we may perhaps look for other worlds to conquer, having established our supremacy at home meanwhile.

But can the average speculative, booming California lemon grower be relied upon to tie himself down to the requisite minutia of method—to the painstaking and slow process of making a first class lemon? And, having proved his ability, will he persist, and stay with the undertaking until both the dealer and consumer are satisfied that a California lemon is as good as a Sicily lemon in all respects? If so, then go in for California lemons and get squeezed to universal extent. It appears to me, however, that while a few will succeed in making the business profitable, the majority are liable to fail either from lack of sufficient capital or from inattention to details when harvest time comes.

Yet, I would not discourage the effort to largely develop this branch of the citrus industry, as I believe it to be entirely practicable for Florida and California to eventually control the American markets in this trade.

What I desire to indicate is, that it is not the kind of business to base a boom upon either as a speculation in real estate or with the hope of rapid fortunes from sales of fruit. Those who undertake it must so systematize and apply the requisite methods of curing—regardless of cost or apparent loss of time in reaching market—as to nearly or quite eliminate the risk of loss or shrinkage after the fruit leaves the packing house. Only in this way can the business be made staple in character, like the Sicily lemon trade, which has regularly, for a series of years, profited upon the necessities and tastes of the people of this and other countries.

The exact and proper methods of curing have, until recently, been supposed to be both difficult and peculiar; but the success of a few earnest and persistent men, coupled with their plain and simple statement of manner of handling, has quite exploded the fallacy.

Capital is a great assistance, however, and the more it is put into the business the greater the relative economy in realizing the maximum of profits. To this end I suggest that the initiative steps, looking toward the capture of the markets east of the Rockies, be left mainly to capital and corporate management, and that those would-be growers, having but limited resources, give their attention to such branches of fruit production as are inexpensive in original outlay and subsequent management. While the profits may not compare favorably with what seems to be expected from lemon growing, yet they are reasonable and certain.

The thoroughly marketable lemon is to a great extent a hand-made article, and should bear for its trademark, "No excellence without great painstaking." Following this motto, there are millions to California in the lemon trade, with no immediate danger of overdoing it. If capitalists could realize and accept this fact, and would agree to put money (at the proper time) into large packeries throughout the lemon

belt of this State, and would further agree to be satisfied with such a per cent of profit in running them as would stimulate production, then it would answer for every prospective grower to take a hand in booming the lemon industry.

Small growers—the more of them the better—would then contribute greatly to the strength and stability of such enterprise by the steady and even flow of fruit during the packing season, on the principle that “many a little makes a mickle.” The market would be at their door, and they would soon learn what fruit was salable, when to pick, and how and with what care to convey it to the packery. The returns to them for each picking would be immediate, and at the same time the aggregate proceeds of the crop would be distributed through several months, and would, perhaps, be more economically expended than if received in one lump sum. This is substantially the Italian method of gathering the aggregate crop for export, and it strikes me that it might be adopted here to the mutual benefit of both capital and labor, or, in other words, of producer and packer. The thorough application of systematic methods of curing is thus placed in the hands of a central experienced management in each locality, and the grower is relieved from further care or risk after delivery of the fresh fruit in such condition as will pass the inspector, who determines the quality and fixes the price.

What a great and profitable industry might be built up on this coast if only capital and labor would unite and work together in mutual interest and harmony, and without waste or friction.

THE PLACER COUNTY FRUIT DISTRICT.

By W. G. GESTER, of Newcastle.

It is located about on the north line of the central third of the State. It embraces a block of territory ten miles in width along the Central Pacific Railroad for a distance of thirty miles. Somewhat similar conditions, as regards natural formation, climate, and resources, exist in the neighboring counties of Sacramento, El Dorado, and Nevada.

Geologically it is made up of numerous irregular spurs and intervening valleys that extend down and out westward from the Sierra Nevada. The extreme tops of the most prominent ridges are in places capped with lava and cemented gravel, upon which exists a not particularly heavy growth of oaks and digger pine. But one attempt has been made, to my knowledge, to utilize these rather forbidding lava spaces. The experiment was with the olive; success not such as to induce extended plantings.

The slopes of these ridges, the knolls and rolling valleys between them, are the fruit lands. The lowest portions of many of the ravines have been denuded of soil by gold hunters. In some cases these mined-out places have been subsequently filled with “slickens.” Some of the best cherry and pear orchards the district has are planted in these slickens beds.

Very little of the soil suitable for horticulture is without a natural tree growth, consisting mainly of white, black, and live oak, digger pine, and chaparral. The cost of fitting such ground for orchard planting

varies from \$15 to \$30 per acre; and such uncultivated lands are valued on the Assessor's books at from \$10 to \$75 per acre.

Real property is already divided into such small holdings that the large orchard of the capitalist will necessarily be a rare exception. It is already a region of small homes.

The soil at the upper or eastern end of the district has a foundation of slate. Much the larger part, especially in that portion in the lower end of the district most thoroughly developed, is a disintegrated granite of dark red color, derived from an unusually large constituent proportion of peroxide of iron. The loose top soil varies in depth from two to five feet, except in the valley bottoms, and in occasional instances on north slopes, where it is deeper. Tree roots, however, go through the soil and grow into the bedrock, so called, which is hardly so much a rock as an indurated soil.

Growers of fruit in the slate soil declare that they have no need to resort to artificial irrigation. The slaty portion of the district is that portion having the greatest elevation and the greatest consequent annual rainfall—thirty to forty inches. It is from one thousand three hundred to three thousand feet above sea level. The average rainfall on the granite soil is twenty-five inches. Artificial irrigation is essential over all this district, which is from one hundred to one thousand three hundred feet above sea level. The water used comes from the higher altitudes in the Sierra Nevada. It is sold by the South Yuba Canal Company to consumers for \$45 per miner's inch per year. There are no permanent water rights appertaining to the lands.

With care a miner's inch of water will irrigate five acres of fruit trees. It costs a Placer County fruit grower, therefore, \$9 per acre annually for water for bearing orchards.

Water is distributed among the trees by small trenches. Flooding, from the nature of the lay of the land, is impossible. It is all sloping, some exceptionally steep slopes at an angle of 20 degrees. Some of these steep slopes in the Citrus Colony, near Loomis, have been terraced. This is very expensive work, but satisfactory, it appears, to owners, whose orange terraces are certainly very beautiful. Terracing is never absolutely necessary, and the great initial expense will limit its use. Moreover, unplanted land with light slopes is still plentiful.

The orchards of the Placer County fruit district are small. The largest at present in bearing do not exceed eighty acres. The average size is, perhaps, about twenty acres. No point in the district is more than five or six miles from a railroad station. This circumstance, in connection with the excellent carrying quality of the foothill and mountain fruit, accounts for the large proportion of fruit disposed of in its fresh state. There is not a cannery nor permanently running evaporator in the district. There are, however, ten wholesale shipping concerns. These houses buy for sale and shipment on their own account, or sell on commission, at the option of the producer.

During the season of 1890 they shipped thirteen million pounds of fresh fruits, one fifth of the total fresh deciduous fruit output of the State, or one tenth of the total fresh fruit shipments (citrus and deciduous) of the entire State for that year. During the season of 1891, up to the first day of November, they have shipped nineteen million pounds, an increase over 1890 of 47 per cent. About 75 per cent of this output consists of peaches. The rest consists principally of grapes, pears,

plums, cherries, and berries. To name all the fruits shipped would be to name the list of all the fruits grown in California, except the pine-apple and banana. Many of them are, however, grown in but small quantities.

The crops of citrus fruits promise to increase rapidly. There has been much planting of orange trees during the past four years, and a very noted increase during the past two years. Citrus fruits ripen, or perhaps, more correctly speaking, they acquire sufficient color for marketing very early. Prices secured are consequently high, and orange growing has proved very remunerative. All of the orange crop of the Placer district is marketed before the first of January. Most of the early varieties—Homosassa, Parson Brown, etc.—and some of the seedlings, are ready for the pickers by the latter part of November. The comparatively frostless part of the district (Placer's portion of the Northern Citrus Belt) lies below the city of Auburn.

The more elevated portion of the district about Colfax and Dutch Flat supplies perhaps the best grapes, pears, and apples.

That the fruit industry of the Placer district is a profitable one, is evidenced by the largely increased planted areas, made up not of large orchards, but of innumerable and annually recurring additions to all the little orchards in its boundaries.

The average cost per acre for the labor of cultivating, irrigating, and harvesting on the slopes, which form so large a component part of the district, is presumably greater than on comparatively level ground. The compensating advantage the Placer County grower has is in his peculiarly fortunate location as regards earliness of fruit, and in his markets. Avoiding comparison, it may safely be asserted that his fruit ripens early, even for California, and although the bulk of his crop goes to the far East, a very respectable percentage is distributed throughout the adjoining States and Territories to what is known as the "local trade;" and it is a very remunerative one, enabling him to dispose of much fruit which, unavoidably ripening too far, is unfitted for the trans-Missouri market. In spite of the fact that little fruit is dried or preserved for market, there is little waste.

The horticultural calamities that are dreaded are confined principally to insect pests. Wet winters and consequent floodings are not feared. Killing frosts are very rare. Orange smut is unknown; so are all orange pests so far. On deciduous trees common scale and codlin moth have caused most damage, but careful and universal use of the spray pump has nearly obliterated the former, and is proving of very noticeable benefit in the case of the moth. Our County Board of Horticulture is strict in the performance of its duties and has the staunch support of the county government and the mass of the inhabitants throughout the district.

The element that detracts most largely from the pleasure of existence in the Placer fruit district is the heat of midsummer. The months of July and August are very often uncomfortably warm. The thermometer frequently registers 100 degrees Fahrenheit, and occasionally 6 or 7 degrees more. Continual moderate heat, entirely void of humidity, and continual sunshine may be expected from May to November. The early ripening of citrus crops, and especially their early coloring, are natural consequences of this phase of the climate.

Making a prediction, based upon a rather careful survey, I should say

that the Placer County fruit district will always grow a large variety to supply the demands of the market for fresh fruits; but I think the two varieties that will overshadow all the others in proportions and importance will be the peach and the orange.

RESOLUTIONS.

Mr. BENSON offered the following:

Resolved, That a vote of thanks be tendered to the people of Wheatland for their generous hospitality and courteous entertainment.

Adopted.

Mr. AIKEN offered the following:

Resolved, That we tender the presiding officer and the officers of this Convention our hearty thanks for the able and impartial manner in which they have performed their duties on this occasion.

Adopted.

ADJOURNMENT.

Mr. BUCK: It is now time for adjournment, and I wish to thank you all for the strict and kind attention to the gavel while it has been used by me. I certainly have spent four very pleasant days—days that I feel I have been highly honored by the audience over which I have been called upon to preside.

Adjourned *sine die*.

B. M. LELONG,
Secretary.

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ANNUAL REPORT

OF THE

STATE BOARD OF HORTICULTURE

OF THE

STATE OF CALIFORNIA,

FOR 1892.



SACRAMENTO:

STATE OFFICE, : : : A. J. JOHNSTON, SUPT. STATE PRINTING.
1892.

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CALIFORNIA STATE BOARD OF HORTICULTURE.

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L. W. BUCK, Vice-President.....Vacaville,
Commissioner for the Napa District.

FRED. C. MILES, Treasurer.....Penryn,
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I. H. THOMAS.....Visalia,
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A. BLOCK.....Santa Clara,
Commissioner for the San Francisco District.

B. M. LELONG, Secretary.....Ex officio Chief Horticultural Officer.

STAFF:

ALEXANDER CRAW.....Quarantine Officer and Entomologist.
ELLA F. HALLAHAN.....Clerk.

OFFICES:

No. 220 SUTTER STREET, SAN FRANCISCO, CAL.

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REPORT.

To his Excellency H. H. MARKHAM, Governor:

In accordance with law, we have the honor to submit herewith our report for the year 1892, being the fourth annual report since the law was amended (Chapter XI, of laws of 1889) from biennially to annually, and the ninth report since the inception of this Board.

The wealth and prosperity of the State have been largely increased during the past season by the planting of vast areas of land to orchards. "While science is to shed light on the path of instructive progress, to lead to the development of natural resources; art to mold and refine; æsthetics to react on the tone of social and domestic life; literature a guiding influence on the progress of the times, on the welfare of the State; economy to advance mutually the interests of the whole population, it is left to our gathering to advocate the vast interests involved in horticultural pursuits."

At various seasons of the year we have invited those engaged in horticultural pursuits to meet and counsel over problems that confront them. These meetings, one of which you did us the honor to attend, have proved very beneficial, and have had, in effect, the solving of many important questions.

It is not only necessary to know how to grow fruit and where to grow it, but when grown how it shall reach the consumers. How to grow comprises the general knowledge of tilling the ground, planting, care, etc. What to grow, the right varieties; where to grow, the adaptability of certain localities for certain special varieties or kinds of fruits. This knowledge, with the further knowledge of how to keep in check maladies that affect the different crops, and how to prevent the introduction of foreign ones, has occupied our attention, and our efforts have not relaxed in that respect. The loss of time, the waste of money, and the discouragements that arise from want of knowledge in the growing of fruits, are probably greater than in any other business, consequently the great importance of disseminating such knowledge through the medium of yearly assemblages.

California is to-day the greatest fruit-producing State in America, or in the world, and its future will equal in its greatness the capacity of the human intelligence for expansion. The fruit crop of the present year averaged about two thirds of a crop and prices necessarily ruled high, and there was a marked increase in the demand for California fruit. The fruit in most every instance showed marked improvement in quality and exemption from diseases and pests, this being due to the eternal vigilance on the part of growers in keeping all such impediments in check.

California fruit cannot be excelled, and while it has the East for a market, it also has the world for a market; but those markets must be

sought, and the necessity for finding them is apparent. The shipment of green fruit by expedited transit to England was undertaken this year for the first time by some of our enterprising fruit men, and on the whole proved successful. The fruit went forward in refrigerator cars and was selected and packed with special care. It arrived in good condition and sold at fairly good prices, thereby demonstrating beyond a doubt its superior keeping qualities and justifying dealers in handling the product. From the general satisfaction the fruit has given we may expect the shipment of fresh fruit to England to become a most important business. We are assured that so long as we can supply sound fruit of such superior keeping qualities, it will always find a ready market at prices that will prove fully remunerative to the California growers. Practically, California fresh fruit was unknown to England's millions until this year, and that hereafter they will lapse into forgetfulness of it is wholly improbable. As the production increases other distant markets will have to be sought, and the success already attained will stimulate future trans-Atlantic shipments, which will be greatly encouraging for a thriving industry, and the market for California products will be greatly enlarged.

The system of disposing of fruit by auction at San Francisco was undertaken this year with fair success, and while it did not prove altogether successful, for various reasons, it fully demonstrated the practicability of the scheme, and the proper way of disposing of perishable articles. This method of disposing of our fruits has formed a part of our programme at our yearly assemblages, and will no doubt receive sufficient support next year to make it a success. We have strongly advocated that the growers generally combine and establish in San Francisco a State Fruit Exchange, through which their products could be sold and future markets sought. The action already taken, especially in the formation of associations in the various counties, is to be commended. Often the unsatisfactory condition of the profits of the business lies in the method of marketing, and the only remedy for this is a complete organization of the fruit producers under such management as will cause harmony of action and concentration of shipments.

The olive industry is at present greatly hampered by the adulterations practiced in this State. Adulteration and sophistication of food products is an abomination that no language is too severe to condemn, and no question to-day so much concerns the American people. The Act passed by the last Legislature to prevent adulteration has been in a great measure inoperative, for the reason that adulterated olive oils, or the sophistications that were exposed for sale, were simply relabeled, substituting the words "salad oil" for olive oil. These labels were placed over the former labels and the oil sold as salad oil, at the same price and under the same false statements by the dealers as before, and so long as consumers are not aware of the dangerous admixtures imposed upon them by false representations, or that sufficient legislation cannot be had controlling absolutely the character of food products, so long will this law be violated. It is incumbent upon us to promulgate such information as must deter all intelligent people from being deceived by adulterated compounds.

It was to enlighten the people as to the unwholesome effect of these spurious articles that conventions have been called by us for the purpose of having the growers unite to defeat, if possible, the sale of

such goods under false representation. The result has been that since this organization the people have been taught, in a measure at least, the injurious effect of adulterated oils upon the human system.

The Act to regulate the practice of pharmacy, approved March 11, 1891, has not met with any better success, for the reason of a serious defect in the conditions of its enforcement, as shown in the following section:

SECTION 9. On written complaint being entered against any person or persons, charging them with specific violation of any of the provisions of this Act.

Thus, one familiar with modern litigation, will be very slow to make a complaint. This Pharmacy Act should be amended, and we recommend the striking out of that part of Section 9, and substituting the appointment of drug inspectors of competent knowledge and expert training, and clothed with proper authority, to prevent the compounding of prescriptions with adulterated articles, regardless of the result upon the unfortunates who take them.

The Olive Oil Act should be amended by including all food products; that every food product exposed for sale shall contain on the label: (1) the name of the manufacturer or compounder, with the place of manufacture or compounding; (2) the names and actual percentages of the different ingredients composing the article, and (3) the actual quantity, if liquids, contained in the package, and if solids, the actual weight. It is due all classes that they should be protected from noxious or poisonous mixtures, and it is the duty of every intelligent being to throw all his power in the line of arresting this most monstrous evil. The Pure Food bill now pending before Congress, and which will probably become a law, will aid us in enforcing in our State the most stringent measures against adulteration.

The collecting of statistics and reliable information of the actual condition of the horticultural interests of the State, at the various seasons of the year, is of the greatest importance. We hope the Legislature will aid us in the establishment of statistical agents in different sections of the State. We find it very difficult to collect statistics from growers, for the reason that trees are taxed separately, while heretofore they have been taxed as improvements, and many are therefore slow to make returns. The general sentiment prevails that trees should be exempt from taxation. It is certainly an impediment to fruit growing, and renders it difficult to get accurate information.

It may be well to here draw the attention of the Supervisors to their duty in the matter of collecting statistics by the Assessors, in the hope that they may be induced to take some action for the gathering of such accurate statistical information as is required by the different branches of the State Government. The County Government Act (Statutes of 1883, p. 274) provides as follows:

The Board of Supervisors must require the Assessor to report to the State Board of Equalization annually a true statement of agricultural and industrial pursuits and products of the county, with other statistical information as they may, by ordinance, direct, and enforce obedience of the Assessor thereto by deducting such proportion of his compensation as Assessor as to them may seem appropriate for a failure to comply with the order.

If the Supervisors would take the matter in hand, as here required, the work can be much simplified, and with little, if any, additional

work laid upon the Assessors, much valuable information can be furnished in regard to the business condition of the State, and each county will benefit by it. At present there is great laxity in most counties in this respect, and while some of the Assessors perform the requirements of the law faithfully, in others their returns are mere guesswork, and in others no effort is made to gather the required information. While this is true to a large extent, we find that the importance of the work is becoming more appreciated, and it has been better done this year than ever before, the returns being fuller and evidently more accurate.

This Board, being desirous of reporting the actual acreage in fruits and condition of horticulture in the State, placed several agents in the field, who visited every county, and is therefore able to give, in the present volume, approximately, the desired information, and is the first work of the kind ever undertaken, which we think is of great importance in the business interests of the counties and the State at large. Also, it is of the utmost importance to the producers to know from time to time the condition and amount of the foreign products with which their's compete. To this end we have asked the Department of State at Washington to aid us through the consular service. We hope to secure the information by the consular officers reporting to the Government by telegraph at the different seasons.

The future of successful fruit growing in California depends upon keeping out the baneful maladies that have proved a great menace to the industry in many parts of the world. We ask the Legislature to pass such measures that will strengthen those now existing, whereby this may be accomplished.

During the present year we have caused the inspection of the following steamships and sailing vessels, from foreign countries, to prevent the introduction of foreign pests and diseases, as provided for by law, viz.:

Steamers from Japan and China	23
Steamers from Australia and New Zealand	12
Steamers from Sandwich Islands	8
Steamers from Central America	4
Sailing vessels from South Sea Islands	7
By rail cars from Eastern States	14
By rail cars from Southern States	9

Plants and trees inspected in the above shipments:

Ornamental plants	74,445
Fruit trees	53,893
Citrus trees	372,700
Citrus trees disinfected	47,700
Citrus trees found infected beyond cure and destroyed	326,500
Fruit trees destroyed	36,225
Ornamental plants destroyed	525
Total	501,093

Besides these, the following shipments have been inspected in the various counties, upon their arrival:

From France, fruit trees and plants	1,022,221
From England, plants	16,926
From Eastern States, fruit trees	453,234
Ornamental plants	3,003
Total	1,495,384

Shipments inspected from within State:

Fruit trees	186,000
Ornamental plants	2,900
Citrus trees	122,700
Total	311,600

Various cases have been brought before the Courts to prevent infected nursery stock from foreign countries from being distributed in the State until the requirements of the law were complied with, and three condemnation suits were brought. This has been accomplished with the aid of the Attorney-General, whose services in this respect are to be commended. The law in each instance was upheld by the Court.

The question of insect pests is better understood than formerly, and effectual remedies for their suppression have been discovered, yet there is always room for improvement, and every season gives us more enlightenment. We find the formulas of this Board generally used throughout the State, with very satisfactory results; thus the experimental work of this Board, in a large measure, has greatly benefited the growers of citrus and deciduous trees and protected them from the ravages of baneful pests and diseases.

The experience we have had and the marvelous results attained from parasites introduced are sufficient to convince every intelligent being that by no other plan can we accomplish what we have set out to do. All noxious insects have parasites or predaceous insects that feed upon them and prevent them from becoming a bar to successful fruit growing. Is it not wiser, therefore, to search for these parasites to prevent the spread of our dangerous foes than to undertake to take this matter out of the hands of the Creator to manage in our own way?

In accordance with the funds appropriated by the last Legislature, we have introduced other parasites, from which we expect to derive equally good results, and there can be no doubt but that in course of time the fruit growers will be able to overcome every insect pest by means of its natural enemies. At best, spraying, fumigating, or any other method can only keep in check temporarily the destructive enemy until such time as the parasite can be found to do the work as nature intended. New insects are appearing, also fungi not before observed. The inroads made by these enemies on the fruit products is a serious loss to the fruit growers, and if not arrested will make it impossible to continue the business, and entail millions of dollars of loss to the State. Shall we rest and see everything go to waste and destruction, or shall we go on and become the greatest fruit garden the world has ever seen?

A "Fertilizer-Control Law" is greatly needed in this State. California has become old enough to consider seriously the question of fertilization. The need of such a law arises from the fact that fertilizers are a kind of merchandise which the consumer is altogether unable to judge of, except from the good or evil results of its use; evil, because of expenditure of money to no useful purpose. Also to prevent the adulteration of fertilizers, and their sale under false representation.

A "Package Law" is also needed, to regulate the use of fruit boxes by firms and individuals. Great quantities of inferior fruit are put upon the market by unprincipled dealers, and sold in boxes bearing the stamp of growers of high-class goods. By this means great injury is done the business of reputable firms. The passage of such a law would

also prevent fruit infected by pests and diseases being taken into localities exempt from them, and thus be conducive of great good in remedying the existing evil.

The following report shows the amount of work transacted by this Board, and the condition of its affairs, and to what purpose the funds for its uses have been applied, viz.:

To the honorable State Board of Horticulture:

GENTLEMEN: Your Executive Committee begs leave to present the appended report for your consideration:

The committee met in the office of the Secretary, at the rooms of the Board, on the 18th of April, 1892, and examined all the books of accounts, bills, vouchers, records, etc., which had accumulated from the beginning of the forty-third fiscal year, July 1, 1891, to and including February 10, 1892.

In this examination we found the journal and ledger to be fully verified by the bills and vouchers, and in no instance did we find a disagreement. On the 23d of April the committee adjourned to July 18th.

Committee met, pursuant to adjournment, and have completed the examination and comparison of all books of accounts, bills, vouchers, papers, and documents relating to the business of the Board, and found the entire work of B. M. Lelong, the Secretary, accurately done, and from which we have condensed the following statement:

July 1, 1891, the Board had at its disposal an appropriation made by the Legislature of \$10,000.

Traveling expenses of Board attending Fruit Growers' Convention at Marysville	\$239 23
Traveling expenses of Executive Committee, July meeting, 1891	143 45
Stenographer (reporting Marysville Convention)	200 00
Traveling expenses of Secretary and quarantine guardians to Marysville	53 50
Salaries of special quarantine agents	790 00
Traveling and other expenses of special quarantine agents	98 95
Traveling and other expenses of quarantine guardian in pursuance of investigations throughout the State, under instructions of the Board	359 05
Rent of offices	1,485 00
Addition to library	1,278 10
Lithographing	1,092 00
Carpenters, painters, and plumbers' work making changes in offices	82 00
Exchange of safe	200 00
Sketching, drawing, engraving, and electrotyping	1,005 30
Experimenting (including purchase of materials, chemicals, fruits, etc.)	231 90
Postage stamps	466 75
Janitor	183 50
Office boy	133 00
Telegraphing	69 50
Subscriptions to papers and journals	102 86
Incidental office supplies and expenses	411 53
Printing of bulletins and other miscellaneous printing	242 00
Expressage, freight, and cartage	371 65
Traveling expenses Secretary (less Marysville Con.)	280 45
Traveling expenses Vice-President (Fresno Con.)	23 20
Traveling expenses Executive Committee (April, 1892, meeting)	145 00
Total	\$9,687 92
Bills paid in June, 1892, but not presented to State Board of Examiners	238 25
Bills now before State Board of Examiners	67 00
	\$9,993 17

LIBRARY.

Total number of books as shown by catalogue	1,713
Books not catalogued:	
Duplicate books held for exchange	74
Annual directories (San Francisco) and State gazetteers	9
Miscellaneous volumes	2
Miscellaneous volumes to be bound	33
Total number of volumes	1,831
Bulletins to be bound, but the number of volumes not determined	177

Cost of Library

As shown by—	
Report Executive Committee, folio 19, annual report 1890	\$1,545 00
Also annual report 1891, folio 27	269 70
From last report to date (see disbursements)	1,278 10
	\$3,092 80

In recounting the publications of the Board issued during the year, we consider it would be an act of injustice on our part to withhold the proper credit due to B. M. Lelong, the Secretary of the Board, for the tireless industry displayed in collecting and compiling the vast amount of information contained in the annual reports and the various pamphlets and bulletins, to which the attention of the horticulturists and every other person interested in the progress of the State is particularly directed. The titles and descriptions are as follows:

Annual Report of 1891. Illustrated by 5 colored plates, 104 wood engravings, 7 photo engravings. (488 pages)	10,000 copies.
Destructive Insects. Illustrated by 1 colored plate, 53 wood engravings, 6 photo engravings. (51 pages)	10,000 copies.
Report Olive Growers' Convention. (40 pages)	10,000 copies.
Peach Yellows. Illustrated by 4 photo plates, 1 zincographic map. (29 pages)	10,000 copies.
Prune Industry. Illustrated by 18 wood engravings. (33 pages)	10,000 copies.
Propagation of Trees. Illustrated by 68 wood engravings. (38 pages)	10,000 copies.
Citrus Fruits. Illustrated by 1 colored plate, 8 wood engravings, 1 zincographic map. (38 pages)	10,000 copies.
Orange Culture. Illustrated by 1 colored plate	10,000 copies.
Internal Parasites. Illustrated by 3 wood engravings	5,000 copies.
Peach Tree Borers. Illustrated by 7 wood engravings	5,000 copies.
Horticultural Laws	5,000 copies.
Regulations of State Board of Horticulture	5,000 copies.
Fig Caprification. Illustrated by 5 wood engravings	500 copies.
Bulletins, posters, etc.	50,500 copies.
Total	151,000 copies.

In the matter of the expenditure of the appropriation of \$5,000, made by the Legislature of the State for the purpose of procuring parasites which would destroy the various insects which infest the orchards in various parts of the State, and which work was assigned to Mr. Albert Koebele, your committee have examined all the accounts, vouchers, etc., relating to the disbursements of the fund and embraced in vouchers No. I to VIII, inclusive; also cash vouchers as shown on page 197 of Koebele account book, and find as follows:

Total amount paid to Mr. Koebele in cash, and transmitted to Australia in drafts, and by telegraphic transfer to his order	\$4,000 00
Expense of transmitting said funds	63 65
Total amount disbursed	\$4,063 65
Cash now in bank	\$920 00
In hands of Secretary	17 35
	937 35
Total	\$5,000 00

In again calling the attention of the Board to the extent and character of its publications, as detailed above, it is not necessary to say that no other State has ever published literature relating to horticultural matters which approaches that which has been issued under the direction and with the approval of this Board.

The wonderful progress which has been and is now being chronicled in every department of horticulture in California, a degree of progress hitherto unknown, when *time* is considered, is, without doubt, to be in a large measure credited to the annual report and subsidiary reports and bulletins which embrace and cover the more important subjects of horticulture so far as developed in this State, and are each year placed in the hands of all who desire to avail themselves of the experience and advice of the more thoughtful of our horticulturists.

The ability of the Board to secure the best results attainable can only be increased by the generosity, or restricted by the lack of generosity, of our State Legislature in making appropriations adequate to the necessities which this Board so well knows, and every horticulturist should know, exist. And it appears to be the duty of each and every member of this Board to use his utmost influence, "in season and out of season," to call public attention to the almost supreme importance of electing such representatives to the Legislature as shall, in advance, identify themselves on the side of the *producer*, and in the material progress of the State.

The incessant demands of horticulturists, and particularly those who are now settling up and improving all sections of the State, for such information as will lead them to avoid the expensive mistakes known to have been made by horticulturists who have preceded them, make it imperative that the road to success shall be open to them, so that they may not exhaust their resources in trying to verify in California the ideas and methods brought with them from other countries, or other sections of our own country.

We cannot too strongly impress upon the members of the Board the responsibility which rests upon each individual member, and which cannot be transferred to the Board as a body, and each individual member should see to it that the information collected with such care and published with such expense shall be given the widest publicity, and thereby secure such influence as shall enable the Board to increase the area of its usefulness.

All of which is respectfully submitted.

J. L. MOSHER,
FRANK A. KIMBALL,
ELLWOOD COOPER,
Executive Committee.

FINANCIAL STATEMENT.

The following are the expenditures for the forty-third fiscal year:

Library.....	\$1,278 10
Janitor.....	198 50
Rent.....	1,620 00
Stenographer.....	200 00
Postage.....	468 10
Sundries.....	331 23
Traveling expenses.....	1,341 98
Supplies.....	253 45
Repairs.....	124 97
Telegrams.....	70 60
Expressage, freight, and cartage.....	378 05
Publishing.....	2,179 80
Furniture.....	200 00
Papers.....	110 64
Messenger.....	148 00
Special agents and experimenting.....	1,022 75
Salaries.....	4,800 00
Total.....	\$14,726 17
Bills now before State Board of Examiners.....	67 00
	\$14,793 17
Appropriation.....	14,800 00
Balance.....	\$6 83

We have compiled a series of reports that have had no equal. It is a monument to the State of California, and a credit to the fruit growers. We have in the line of this work about completed many branches therein treated, and must change somewhat the current of our thoughts, and embrace other subjects that concern our civilization. The waste of money, the waste of energy that results in undertaking impossible things, impress us more seriously from day to day. We have arrived at that point in our horticultural work that calls for greater efforts than at any previous period, and probably the turning point that must mark the future advancement. We therefore urge the republication of all our reports, from 1885 to the present time, in abbreviated form. It is necessary for the benefit of the fruit growers; it is necessary for the benefit of public education, and it is necessary for the honor of the State of California to have such a work to exhibit at the Columbian Exposition, to show to the world what has been done in the line of horticultural progress.

It affords us great pleasure to acknowledge with gratitude the valuable assistance rendered this department by Hon. J. W. Anderson, Superintendent of Public Instruction; and to the County Superintendents of Schools, and also to the principals and teachers who have furnished us with valuable information concerning their respective districts we express our thanks.

To Mr. Theodore H. Hittel, of San Francisco, our thanks are due for assistance rendered.

Our thanks are also due to the following special agents whose duty it was to visit the different counties assigned them and personally collect the statistics, etc., embraced in this report, viz.: Mr. John Isaac, of San Bernardino; Mr. C. H. Allen, of San José; Mr. Ed. M. Ehrhorn, of Mountain View; Mr. R. H. Hewett, of Los Angeles, and Mr. H. A. Brainard, of San José.

To Mr. Alexander Craw our thanks are especially due, he having made personal inspection and collected the statistics of five counties without

neglecting his duties as Quarantine Officer. Miss Ella F. Hallahan, of Oakland, has discharged, as before, the duties of office clerk very satisfactorily.

We desire also to compliment them all for their indefatigable efforts in the performance of their respective duties. To fruit growers, State and county officials, our thanks are especially due for valuable assistance rendered.

Very respectfully,

ELLWOOD COOPER,
L. W. BUCK,
FRANK A. KIMBALL,
J. L. MOSHER,
A. BLOCK,
FRED. C. MILES,
SOL. RUNYON,
I. H. THOMAS,
A. F. WHITE,
Commissioners.

B. M. LELONG,
Secretary and Chief Horticultural Officer.

Subscribed and sworn to before me, at San Francisco, Cal., September 29, 1892.

[SEAL.]

R. M. EDWARDS,
Notary Public.

REPORT

OF

B. M. LELONG,

Secretary, and Chief Horticultural Officer.

CALIFORNIA HORTICULTURALLY.

REPORT OF B. M. LELONG, SECRETARY, AND CHIEF HORTICULTURAL OFFICER.

CHAPTER I.

GEOGRAPHICAL.

California occupies about one half of the western coast of the United States. It extends from latitude $32^{\circ} 50'$ on the south to 42° on the north, a total length of about 800 miles, reaching through nine and a half degrees of latitude. Its average width is about 200 miles. It is only by comparison that the significance of these figures can be understood. The same length on the Atlantic takes in the coast of Massachusetts, Rhode Island, Connecticut, New Jersey, Delaware, Maryland, Virginia, and North and South Carolina. The area of California is equal to the combined area of Massachusetts, New York, Pennsylvania, Maryland, and Virginia. There is one valley in the State, the San Joaquin, in which, were all the New England States placed, only about one half of Maine would lap onto the foothills.

The most westerly land in California is Cape Mendocino, whence the coast trends to the southeast, with a westerly convexity, to San Diego Bay. The distance between the extreme northwest and southeast corners, from Crescent City, in Del Norte County, to Yuma, in San Diego County, is 775 miles, and the greatest width, from Point Arguello, in Santa Barbara, to The Needles, in San Bernardino County, is 235 miles, and its smallest width, from San Francisco to the southern end of Lake Tahoe, 148 miles. The total area of the State is 158,360 square miles. Its land area is 155,980 square miles, ranking next to Texas, in point of size, among the States of the Union.

In a territory so extensive as California, with altitudes ranging from 300 feet below sea-level to 15,000 feet above, with several ocean currents touching its coast at different points, and mountain ranges extending its whole length, there must of necessity be a great diversity of soil and climate, and an equally great diversity of production. Within this area we find fruits of all parts of the earth, from the tropical, growing in the sheltered slopes of the lower levels, to the hardy fruits of the North Temperate Zone.

This area covers land the most fertile and the most barren on earth, and while a considerable portion of the State is unavailable for agricultural purposes—notably the Mohave Desert and the upper ranges of the Sierra Nevada—there is enough arable land left to furnish homes for an immense population and vast areas of land comprised in the valleys, the foothills, and the valleys of the higher mountains, which now lie idle, will yet be brought under cultivation, and many varieties of fruit will grow on lands now left to the chaparral.

CHAPTER II.

TOPOGRAPHICAL.

The physical features of the State are as varied as are its geographical peculiarities, and comprise mountains, valleys, plains, and desert. Its topography includes the highest and the lowest land in the United States, the most fertile of valleys and the most forbidding waste, copious streams fed by everlasting snow, vast extents upon which no stream is found, glaciers and fields of eternal snow, valleys upon which snow never falls. The topographical features of the State have a direct influence upon the climate, which is here largely a question of altitude and physical surroundings, and necessarily varies materially in different localities within a short distance of each other. As climate and altitude are interdependent, and both have a direct bearing upon horticultural pursuits, a brief account of the chief topographical features of the State as a whole is here given.

The prominent features of California are the two great mountain chains, extending nearly the entire length of the State. The Sierra Nevada on the east, with its snow-capped mountains, its numerous valleys, and its fertile foothills, extending from Kern County on the south to Siskiyou County on the north; on the west the great Coast Range, or rather series of ranges, of much less altitude than their opposite neighbors, and bordering the seacoast the entire length of the State. Between the two lie the two great valleys—or rather the one great valley—of the Sacramento and the San Joaquin. The former is drained by the Sacramento River, which flows from the north to the south; the latter by the San Joaquin, which has its rise in the southern end of the valley, and flows from the south to the north, joining the Sacramento in Suisun Bay, near the geographical middle of the State, flowing through the straits of Carquinez into the bay of San Francisco, thence through the Golden Gate to the Pacific Ocean. These rivers receive nearly all their water from the Sierra Nevada Range, the streams flowing landward from the Coast Range being insignificant, and most of them drying up during the summer season. The main drainage of the Coast Range is seaward, and many small rivers find their outlet to the ocean from their western slope.

The principal rivers feeding the Sacramento are the Pitt River, which rises in Modoc County in two branches, known as the North and South Forks. These flow southwesterly to Fall River City, in Shasta County, where they unite with the waters of Fall River, a very large stream which rises in one vast body from the lava beds near Dana, after uniting with the waters of the McCloud River. Pitt River unites with the Sacramento near Kennet, in Shasta County. The next most important tributary of the Sacramento is the Feather River, which has its rise in a number of large springs in Plumas County, and drains the numerous valleys of that county. Three large branches of this river rise here, known as the North, Middle, and South Forks, each receiving numerous tributary streams on their way to the plains. Near Marysville the Yuba River, having its source in Nevada and Sierra Counties, joins the Feather. Further south Bear River, draining a large part of Nevada County, finds its junction with the same river, which is lost in the Sacramento at Vernon, some 18 miles north of Sacramento City. At Sacramento the

American River, which drains El Dorado County, is the last important tributary of the Sacramento.

A very large number of important streams, with an extensive drainage area on the Sierra Nevada Range, in the counties of El Dorado, Amador, Alpine, Calaveras, Tuolumne, Mariposa, and Fresno, feed the San Joaquin River. These are the Cosumnes, Mokelumne, Calaveras, Stanislaus, Tuolumne, Merced, and Fresno Rivers. Other rivers of the San Joaquin Valley are Kings, Kaweah, Tule, and Kern; these receive numerous tributaries, and find their outlet in Tulare Lake, which in seasons of high water overflows into the San Joaquin River. Of late years the water of these streams has been diverted for irrigation, and is used to feed a large number of irrigating canals. As a result these streams cannot be included in the tributaries of the San Joaquin River.

The length of the Sacramento Valley, from its head, a few miles above Red Bluff, to the Calaveras River, is about 160 miles, and its width varies from 7 miles opposite Red Bluff to 15 miles at the county line of Tehama County, where it suddenly expands westward, assuming its average width of 40 miles, or a little over. Northwest of Woodland, in Yolo County, it is narrowed by a promontory of red foothill land projecting into the plain from the Coast Range to about 33 miles, but below this it rapidly widens again to its maximum width of 60 miles, opposite Suisun Bay. Its total area is about 6,200 square miles.

That portion of the great valley traversed by the San Joaquin and its tributaries constitutes about three fifths of the whole, its area from the southern end to the Calaveras River, a distance of 240 miles, being about 11,000 square miles. The southern end of the valley is formed into a separate basin by a low ridge which traverses the valley in the southern part of Fresno, thus forming the Tulare and San Joaquin basins. The Kaweah and Kern Rivers flow for a long part of their distance over an almost level country, and form a delta with their numerous branches as they spread over the plain, in which they are lost for the greater part of the year. These deltas are very fertile, and are known as the Visalia Delta and Kern Island.

But few streams of any importance rise in the Coast Range. One of the principal of these is the Trinity River, which, rising in Scott and Trinity Mountains, receives numerous tributaries, and, flowing northwest, connects with the Klamath, emptying into the Pacific Ocean on the boundary line of Del Norte and Humboldt Counties. Mad River also has its rise in Trinity County, flowing northwesterly through Humboldt to the ocean. Eel River has its source in the Coast Range, in Mendocino County, and follows the general direction of the streams in this portion of the State, having a trend to the northwest. It has two main forks, the North and the South, and receives numerous smaller streams in its course. It empties into the Pacific near Table Bluff, in Humboldt County. Russian River rises in Mendocino County, flows south to about the middle of Sonoma County, and thence west to the ocean. These are the principal streams of the Coast Range north of San Francisco. The Klamath River, which has its rise in a group of lakes in Oregon, runs nearly its whole course in California, passing Siskiyou, Del Norte, and Humboldt Counties. It drains a very large watershed and is one of the most considerable streams of the State.

The Salinas River heads in the Coast Range, in San Luis Obispo County, and flows in a northwesterly direction through the Salinas

Valley, finding its outlet in Monterey Bay. It receives a number of minor tributary streams on its course, and is the principal river draining the southern Coast Range. The Salinas flows mostly on the west side of the valley, a region of mesa lands lying between it and the Santa Lucia Mountains still to the westward. The next stream of importance draining the Coast Range to the west is the Santa Maria, which forms the boundary between San Luis Obispo, and flowing from east to west, reaches the ocean at Guadalupe. Rising in the eastern part of Santa Barbara, the Santa Maria flows its full length through that county to the ocean. Ventura County is drained by the Santa Clara River, which heads in the Coast Range in Los Angeles County, and flows west through Ventura, reaching the Pacific near San Buenaventura.

These streams form the chief system of drainage of the Coast Range south of the Golden Gate. They form a group by themselves. Many minor watercourses connect with them, and many other small streams exist here that flow a short distance and are lost. None of these rivers have any commercial importance, and many of them are reduced to insignificant dimensions in the summer months. For irrigation, however, they are of great importance, and by judiciously husbanding their waters, they can be made to irrigate a vast extent of the lower coast country.

The Sierra Nevada and the Coast Range unite in Kern County, and form the southern end of the San Joaquin Valley. South of this lies the region known as Southern California, and through this the Coast Range continues as a number of broken ranges, without any uniform trend, and having local names. In these a number of streams have their rise. These are usually torrents in winter and dry beds in summer. They are, however, of incalculable value to the country through which they pass, and supply ample water for irrigating purposes. A peculiarity of most of the streams of this portion of the State is, that, except in flood seasons, where left to follow their own course, they become lost in their own beds, which are composed largely of coarse sand, through which the water permeates to the bedrock.

Prominent among the streams of Southern California are the Los Angeles and San Gabriel Rivers, which have their source in the San Gabriel Mountains; the Santa Ana River, which heads in Mount San Bernardino, and the San Diego River. Besides these there are a number of smaller streams, the Santa Margarita, San Luis Rey, Tia Juana, and others. None of these are of any great length or importance, and their chief natural use is the drainage of the winter rainfall of the southern coast mountains. On the east side of the San Bernardino Range, the Mohave River and its tributaries have their rise. This, after flowing a few miles, sinks in the Mohave Desert on the eastern slope of the Sierra. Owens River, heading in Mono County, finds its outlet in Owens Lake, where it is lost.

Besides the great valleys of California, the Sacramento and the San Joaquin, there are almost innumerable valleys of minor size, in both the Coast and Sierra Nevada ranges. These are usually well watered and very fertile and are found at varying altitudes, from ocean-level to 8,000 or 10,000 feet elevation, and varying in area from a few acres to many miles in extent. In Siskiyou County, Scott Valley, 40 miles long and 7 miles wide, lies at an elevation of 3,000 feet. Shasta Valley, in the same county, is a barren lava plain, with some fertile spots. In

Modoc, on the eastern slope of the Sierra, lies Surprise Valley, containing 400 square miles. In this valley are three lakes, whose lengths are, respectively, 16, 20, and 15 miles, with widths of 3 to 5 miles. These lakes have no outlet, and sometimes are dry by evaporation. The length of this valley is about 60 miles, with a width of 15 miles. The valley of Goose Lake is mostly on the eastern side of the lake—which is 30 miles long and 15 miles wide—and reaches back 4 to 5 miles. Big, or Round Valley, on Pitt River, in the southwestern part of the county, reaching into Lassen County, is 30 miles long and 18 miles wide, and is mostly covered with sagebrush.

In Lassen County, Long Valley reaches southeastward to within 15 miles of Reno, and is narrow, except near Honey Lake. It is 40 miles in length, with an average width of but 2 to 3 miles. Honey Lake Valley is about 60 miles long from east to west, and from 15 to 20 miles in width. Between Big and Honey Lake Valleys are Grasshopper, Willow Creek, Eagle Lake, and Hare Lake Valleys, separated from each other and the main valleys by intervening ridges of various heights. In the northeastern portion of Lassen County, at an elevation of 5,315 feet, lies an extensive valley known as the Madeline Plain, extending about 25 miles from north to south, and having a length of nearly 50 miles.

From Plumas County a series of valleys stretch from northwest to southeast for a distance of 100 miles, running into Sierra County. These are Big Meadows, covering 30,000 acres of land, Mountain Meadows, Butte Valley, Indian Valley, Genesee Valley, Clover Valley, and Sierra Valley, the latter being 20 miles long and 10 miles broad, running into Sierra County, and one of the largest of the mountain valleys.

On the eastern slope of the southern Sierra Nevada are numerous valleys, but these partake largely of the desert character of the surrounding country, although some fertile spots are found. Owens Valley is the most important of these. It is a narrow basin between extremely lofty mountains. It has a length north and south of 140 miles, with an average width of 10 miles.

In Mono County are two important valleys, Big Meadows and Antelope, each about 10 miles long, and very narrow.

On the western slope of the Sierra is found the famous Yosemite Valley, in Mariposa County. This valley is about 8 miles long and its average width about 1 mile, its greatest breadth being 3 miles. It has an altitude of 4,060 feet above sea-level, and is of little interest from a horticultural standpoint. Ione and Jackson Valleys, in Amador County, are each 12 to 15 miles long, and from 2 to 5 miles in width. In both of these excellent fruit land is found. In Tuolumne County there are many lakes at the head of the tributaries of the Tuolumne River. The largest of these is Lake Elnor, situated in a valley 4 miles long and 1½ miles wide. In Kern we find Cummings Valley, with a length of 6 and a width of 3 miles; Bear Valley, 3 miles long and 1 mile wide; the valley of the South Fork of Kern River, 8 miles north of Havilah, containing about 40 square miles, and heavily timbered. Besides these, the foothills and higher mountains inclose numerous small valleys, many of which furnish the most favorable conditions in soil, climate, altitude, and water for fruit culture, and in many of these valleys is found the choicest fruit land of the State.

The Coast Range is more broken in its contour than the Sierra Nevada, and more valleys are found in them. These, however, are usually

smaller than those of the Sierra. In Del Norte there are small valleys along the streams, the chief of which is Smith River Valley, with 18,000 acres. Among the mountains of Humboldt County there are small valleys watered by various streams, but the largest tract of level land lies around Humboldt Bay. The valley of Mattole is 12 miles long and 4 to 8 miles wide. The other valleys here are known by the names of the streams that flow through them, as Trinity, Eel, Mad River Valley, etc. Trinity County has also numerous small valleys, Hay Fork being the principal.

In Mendocino County several extensive and fertile valleys are found. Here is the main Russian River Valley, which extends 15 miles into Sonoma County; adjoining it on the north is Coyote Valley, 3 miles long and $1\frac{1}{2}$ miles in width; Potter Valley, 6 miles long and 2 miles wide. North of Ukiah is Little Lake Valley; Sherwood Valley, 5 miles long and 1 mile wide, with an altitude of 2,500 feet; and Long Valley, all containing large areas of valuable land. Round Valley lies in the northern part of the county, and extends into Humboldt County. Lake County is included between the summits of two branches of the Coast Range, which unite at Mount St. Johns, on the north, and have an altitude of 3,000 to 4,000 feet. The valley thus formed has a length of about 40 miles and a width of 15 miles. Clear Lake is a central feature of the valley, and covers an area of one third of the valley. Its altitude is over 1,000 feet above sea-level. There are other valleys of minor importance: The Loconoma, Coyote, Cobb, Long, and others, in which more or less good agricultural land is found.

Passing through Sonoma County, and continuous with the southeast course of Russian River, is a series of valleys, reaching to the bay, and varying in width from 6 miles in Santa Rosa Valley to 3 miles in Petaluma Valley. These are bordered by a range of low mountains on the west and a higher range on the east. Sonoma Valley leaves this central valley near Santa Rosa, and reaches southeastward to the bay, with a width of about 2 miles, widening to 6 miles near the bay. Santa Rosa Valley is about 10 miles long and 6 miles wide. Bennet Valley, 8 miles long and 3 miles wide, unites with it near the town of Santa Rosa. Petaluma Valley is 12 miles long and 3 miles wide.

In Napa County, Napa Valley has a length of 35 miles from the bay inland, with an average width of 4 to 5 miles, except in the northern part, above Yountville, where it narrows to about 1 mile. Knights Valley, in the north, forms a connection between Napa and Russian River Valleys in Sonoma County; it is about 7 miles long and 2 miles wide. East of Napa Valley is Conn Valley, half a mile wide by 6 miles long; Wooden Valley, 3 miles long by 1 mile wide; Pope Valley, 8 miles long and 1 mile wide; Capelle Valley, 2 miles long and half a mile wide; Berryessa Valley, 7 miles long by $1\frac{1}{2}$ miles wide. Besides these are Chiles Valley, Gordon Valley, Foss Valley, and Browns Valley.

In Solano County, Vaca Valley is one of the prominent fruit sections of the State, and with Pleasant Valley covers an area of 12 miles in length by 1 to 3 miles in width. Vaca Valley has a slope to the south and southeast, and Pleasant Valley has a slope to the northward, and both open out into the Sacramento Valley. Green Valley lies north of Benicia, and is about 11 miles long and 5 miles wide. Fairview Valley and Capay Valley are located in Yolo County.

Marin County embraces high hills and small valleys. There is but

little level land in the county, and the valleys along the streams are generally narrow.

The surface of Contra Costa County is largely mountainous, and contains many valleys. Of these the principal is San Ramon, which reaches from Suisun Bay southward across the county, under different names, into Alameda County, where it connects with Livermore Valley. Between the bay and the foothills of Mount Diablo it has for a distance of 15 miles a width of about 6 miles, when it narrows down to 1 or 2 miles. A number of large valleys connect with this on either side, while numerous smaller valleys are found in the mountains here.

Continuing south we find the Alameda, Livermore, Sunol, Amador, San José, Vallecitos, and other smaller valleys, all containing good agricultural land and largely devoted to fruit culture. Livermore Valley is 14 miles long and has a varying width of 5 to 8 miles. Amador Valley is about 8 miles in diameter.

The Santa Clara Valley, with its surrounding foothills, comprises the most important horticultural district within the limits of the Coast Range. This valley has a length of about 70 miles, extending through Santa Clara into San Benito County. Eleven miles south of San José it suddenly contracts to about 100 yards, but opens out again to a width of several miles, continuing to the Pajaro River, where it connects with the Pajaro Valley, which unites it with the Salinas Valley, in Monterey County. From the Pajaro southward for several miles beyond Hollister, its width is about 12 miles, and the valley terminates or rises to a rolling plateau or bench land. Farther south the valley becomes more narrow and elevated, and is rarely over half a mile in width. At its northern extremity on the San Francisco Bay, Santa Clara Valley has a width of 20 miles, and its area in Santa Clara County is 405 square miles. Tributary to the main valley are a number of smaller valleys following the watercourses, but none of these are of importance.

The Pajaro Valley lies in Santa Cruz and Monterey Counties, and is from 6 to 8 miles wide and 10 miles long, the greater part lying in Monterey County. San Lorenzo Valley lies wholly in Santa Cruz County, and is about 20 miles long and of varying width. Monterey is a county of valley and mountain, but the chief valley is the Salinas, which is over 90 miles in length and from 3 to 15 miles in width. It is drained by the Salinas River, which, like the greater part of the southern coast streams, runs dry during the summer months. Carmel Valley lies parallel to the Salinas Valley and west of it. Besides these there are Long Valley, 10 miles long by half a mile wide; Peach Tree Valley, 22 miles long and three fourths of a mile wide; Indian Valley, Priest Valley, and others of minor size. Besides the Santa Clara, which extends into San Benito County, there are in this county Hollister Valley; Bitter Water Valley, a continuation of Peach Tree Valley of Monterey County, 17 miles long and three fourths of a mile in width; Dry Lake Valley, 4 miles long, and the Santa Ana Valley, with an area of about 15 square miles. The Salinas Valley continues into San Luis Obispo County, and is there about 29 miles wide, and has an elevation of about 300 feet above sea-level.

The coast valleys on the west of the Santa Lucia Mountains are narrow on the north, but toward the south widen out to many miles, and are rolling and interspersed with many high ridges and hills. The Osos, Laguna, and Chorro run parallel with each other as far south as the

mission lands around San Luis Obispo, thence the Corral de Piedra Valley continues south until it intersects the valley of the Arroyo Grande; beyond this is the Nipomo, and that portion of the Santa Maria Valley situated on the right bank of the Santa Maria, or Guyama River, which forms the southern boundary of the county where the Santa Maria Valley opens into Santa Barbara County. This valley, which lies partly in San Luis Obispo, but principally in Santa Barbara County, is 30 miles long and 10 miles wide. The Santa Inez Valley, in the latter county, is 30 miles long, with an average width of 2 miles. The Santa Inez range lies on the south, and separates the valley from the coast valley, in which the county seat is situated. The coast valley extends from Gaviota Pass to the Ventura County line, varying in width from 2 to 6 miles, and is divided into an upper and lower valley, the former known as Santa Barbara Valley. Carpenteria Valley lies east of Santa Barbara, and is a coast valley opening south and surrounded by high mountains. On the coast north of Point Concepcion lies Lompoc Valley, with a length of 37 miles, and an area of 35,000 acres of arable land. Between Lompoc and Santa Maria Valleys is the Los Alamos, with a length of 40 miles and a width of 2 miles at its widest point.

Ventura is another hilly and mountainous county, with numerous valleys of varying size, prominent among which are the valleys of the Santa Clara and Buena Ventura Rivers. The former river, which is the longer, is bordered throughout its length by a valley which, from near Newhall, in Los Angeles County, varies in width from a mile or less as far as Santa Paula, then widens gradually, until within about 12 miles of the coast it suddenly expands until it reaches a width of 16 miles. The Buena Ventura is narrow, averaging but one fourth of a mile in width, and is about 30 miles long. The Ojai Valley lies along the Cañada Larga, with an elevation of 800 to 1,000 feet, and is renowned for its fertility.

South of the junction of the Sierra Nevada with the Coast Range, the valleys are very numerous, and here are some of the most important in the State. The territory included in this division embraces the counties of Los Angeles, San Bernardino, San Diego, and Orange. The region subdivides naturally into a division embracing the Los Angeles and San Bernardino Plains, the chief agricultural portion of Southern California, and a division embracing the rolling hills, mesas, and interspersed valleys of San Diego. Both divisions are bordered eastward by the high and rugged mountains of the Sierra Madre, San Bernardino, and San Jacinto ranges.

The prominent feature of the southern region is the San Bernardino range of mountains, which, rising suddenly to an elevation of from 4,000 to 6,000 feet above the sea, separates the coast belt from the great desert. From its junction with the Sierra Nevada Mountains, in Kern County, it trends southeastward, and presently divides into two prongs, the northerly one continuing nearly to the Colorado River and gradually falling in elevation; the other, the San Jacinto range, bending southward, and, with a diminished height, passing out of the State into Mexico. This high range is almost altogether treeless and uninhabitable, has a width varying from a few miles to as much as 30 or 40 miles, and forms an almost unbroken barrier, with but few passes, between the great desert on the east and the agricultural valleys of the coast region.

To the westward of the range the mountains decline in altitude toward the coast, and are interspersed with many small valleys and mesa lands, and are penetrated to a distance of 75 miles eastward from the coast by the broad agricultural region known as the Los Angeles and San Bernardino Plains. The higher mountains, those that lie near the San Bernardino range, are partly timbered with oak, cedar, pine, and fir, while the lower ranges are mostly bare, their lower slopes and cañons being covered with chaparral. This division is watered by numerous streams flowing westward into the ocean, mostly without any great length. Of these the San Gabriel and Santa Ana Rivers, in the Los Angeles Plains, and the San Jacinto and San Diego Rivers, in San Diego County, are the largest.

The large agricultural region reaching inland from the coast, and bounded on the north by the high Sierra Madre, or San Bernardino mountain range, on the west by the Sierra, Santa Monica, and others, and on the east (apart from the San Bernardino Valley) by the Santa Ana Mountains, covers an area of nearly 2,000 square miles. Its extent along the coast is about 65 miles, though broken by some mesa lands and hills. Northward it reaches about 35 miles across a chain of low hills to the mountains, whence it extends eastward for 40 miles in a belt of from 5 to 20 miles in width, forming the San Bernardino Valley, and westward into the San Fernando Valley, its entire length east and west being about 90 miles. It is divided properly into several large valley regions: the San Fernando Valley on the northwest, separated from the coast and Los Angeles Plain by the Santa Monica Mountains; the Los Angeles Plain proper, reaching along the coast from the latter mountains southeastward and inland to the high ranges, and including the San Gabriel Valley; and the San Bernardino Valley, forming the eastern extension alluded to, and separated from the coast on the south by the Santa Ana range of mountains.

San Fernando Valley is about 16 miles long and 12 miles wide, narrowing to a gap on the east, where it enters the Los Angeles Plain. It has an area of about 200 square miles. Antelope Valley lies in the northeastern portion of Los Angeles County, and opens out toward the Mohave Desert. The Los Angeles Valley reaches from Santa Monica Mountains southeast along the coast to the San Diego County line, and the San Gabriel Valley, separated from the Los Angeles Valley and the coast by the Santa Ana range, continues into San Bernardino County. The two latter valleys form the Los Angeles Plain.

East from the Los Angeles Valley, and connected with it by low passes, lies the San Bernardino Valley, with an elevation of 1,000 feet. This is surrounded on the north and east by a high chain of mountains ranging from 6,000 to 11,000 feet in height. The San Mateo Valley is separated from it by a range of low mountains, and extends from San Geronio to near Redlands. In the high mountains of San Bernardino are numerous smaller valleys—as Bear and Holcomb Valleys—but the altitude of these (5,000 to 6,000 feet) renders them unfit for horticultural purposes. Extending from San Bernardino into San Diego County are the San Jacinto Plains, an extensive area, bounded on the northeast by the San Jacinto range, and having numerous buttes interspersed among its level lands. It is drained by the San Jacinto River, which has an outlet in Lake Elsinore, but runs dry in the summer months.

San Diego County is covered with rolling hills and mountains, and

possesses numerous small valleys, but none of great extent. The principal of these is the Cajon, located about 15 miles from San Diego. This valley is 6 miles long and 4 miles wide, and has proven remarkably prolific in fine fruits. Through the hills and mountains are a number of small valleys under cultivation. Among these are the San Luis Rey, Santa Margarita, Las Flores, Valle de las Viejas, Cuyamaca, Santa Ysabel, Mesa Grande, Warners Ranch, Gujito, Bear, Pauma, Smiths Mountain, and a number of smaller valleys.

East of the mountains, bordering the fertile section of the southern portion of the State, lies the vast section known as the desert region, and divided into the Mohave and Colorado Deserts. This reaches from the State line on the south, following the course of the Colorado River, extending to and over the greater part of the length of Inyo County, and covering portions of San Diego, San Bernardino, Los Angeles, Kern, and Inyo Counties; eastward it reaches far into Arizona. On the west it abuts against the foot of the high Sierra, and on the south against that of the San Bernardino range of mountains, both rising thousands of feet above it. The larger part of its surface, as a plateau skirting the foot of the mountains, lies at an elevation of 2,000 feet above the sea, and is comparatively level, though broken frequently by isolated short ranges and peaks rising a thousand feet or less above it. In its center there is a large area which is not more than 1,000 feet above the sea, and in Inyo County a still smaller region, known as Death Valley, sinks to some hundreds of feet below sea-level.

Coahuila Valley, or that portion of the desert included between the two prongs of the mountain range on the south, is mostly below 1,000 feet in elevation, a large portion sinking below the level of the sea, Dry Lake, near Dos Palmas Station on the Southern Pacific Railroad, being said to be some 500 feet below this level. There are scarcely any streams through the desert, except along its border, where they flow from the adjoining mountains and soon disappear in the sands. Mohave River, which gives its name to the northern desert region, is the largest stream, but after flowing from the San Bernardino Mountains for a short distance out into the desert, it suddenly disappears. The desert is a sandy, barren waste, interspersed with salt lakes and alkali tracts, destitute of all timber growth, except occasional tracts of yucca, small nut pines, and juniper. It is, especially on the south, subject to very frequent and severe sand storms, which not only cover the lands of the region with deep and shifting deposits, but often blow through the passes, and, with their lighter sands, greatly annoy the people of the agricultural valleys on the west side of the mountains.

CHAPTER III.

CLIMATIC.

The climate of California, until one has carefully studied most of the conditions, is a recurrence of perpetual surprises. In general terms, we have the wet and the dry season; but aside from this statement, no wide-reaching, general condition can be named. As has been already stated, latitude cuts very little figure, in fact its influence seems, in many cases,

to be reversed. The influence of altitude, contour, contiguous bodies of water, exposure, mountain ranges, and ocean breezes is so great that until these are understood one can hardly form a judgment as to the climate of any given locality.

The term climate should be made to cover three conditions, namely: temperature, humidity, and salubrity. These are all in a more or less degree mutually interdependent, but each has its part to play in the final result.

The ocean climate extends, as does the Coast Range of mountains, the length of the State. The prevailing winds, even unmodified by the daily sea breeze, are from the west. They follow or cover the Japan Current, and are in a measure tempered by it, being much warmer than the general ocean breeze; and these, with the warmer waters that impinge upon the western shore, give to us a warmer climate in winter, and, because of the equalizing effect of the ocean, cooler in summer than places of corresponding latitude on the Atlantic Coast. In Oregon and Northern California these winds are moist, giving great humidity, the rainfall there being very abundant. The several spurs of the Coast Range strip this moisture from the air as it trends down the coast, until in the southern part, south of Monterey, it becomes a dry wind, giving but little rain or fog, except when met by the cooler current from the south, or by a cold breeze from the snow-clad summits of the Sierra; the latter having, perhaps, the greater influence. These come during the rainy season, in apparent south winds, and the amount of rainfall in any given year is gauged and fairly well foretold by the amount of snow on the Sierra ranges.

From this it follows that the coast climate is very equable, comparatively warm, without great regard to either latitude or altitude, moist in the north and usually dry in the southern part. That it is salubrious becomes obvious, for, as there are no considerable marshes, except salt-water tule ground, there is, except in a few localities, an entire absence of malaria. Thus, there are present all the conditions for an exceedingly healthful climate.

It is notable that the isotherm (the line of average temperature) that passes through New York City runs far north of the north line of Oregon, while the line passing through Florida runs nearly as far north as San Francisco.

The climate of the great inland valley, called the Sacramento on the north and the San Joaquin at the south end, is governed by other conditions. Nearly cut off on all sides from cold winds by the Sierra on the east, and more especially by the joining of the Sierra and the Coast Range on the north, by which it is entirely protected from the Arctic winds, and lying as fully exposed valleys, open to the rays of the warm summer sun, we have here, even to the very north end of the valley, a warm, and in the southern part of San Joaquin a hot, climate. There is this anomaly: In many of the small northern valleys between the mountain spurs on either side, the average summer temperature is higher than in the part of the State 400 miles farther south. Longitude makes, for reasons given, all through California, a greater difference in temperature than does latitude. To understand this, reference must be had to the breaking down of the Coast Range of mountains, which in summer allows the cooler ocean winds to pass toward the interior. The effect of this is shown in a marked degree in the climate of Solano,

Napa, Sonoma, Contra Costa, and Alameda Counties, as also in Los Angeles and San Diego Counties on the south. Here again the isotherm passes far north—much farther than on the coast. The temperature in these valleys in winter is determined, however, by latitude and by altitude. The winters are therefore much colder than in the more southern parts of the State. Except upon the summits of the ranges, that is, an elevation of about 4,000 feet, snow rarely falls, and when it does, lies but a few hours at a time, or at most but a day or two. Both in the Coast Range and in the interior valleys lightning and thunder are exceedingly rare phenomena.

The climate in these valleys, except where much changed by these ocean winds through the break, is dry. The winds entering San Francisco Bay are, by the formation of the bay and surroundings, deflected toward the north, giving to some of the counties abundant rainfall. These winds come as apparently south winds, although they originated in the north, and come into the State originally as northwest winds. In the more southerly counties the rainfall grows less, while towards the extreme north, as in parts of Shasta County, it is very great.

The inland valleys are all healthful, except along low river bottoms, where there is some malaria. This, unless prolonged by excessive surface irrigation, will soon pass away, as it has on the prairies in the valley of the Mississippi under the influence of the cultivation of the soil.

At times in the San Joaquin Valley and lands adjacent, a wind prevails, denominated the "hot norther." This is, in the early spring, quite destructive. The cause of this has not been fully and satisfactorily explained, and partly for this reason it is much dreaded by the farmer.

In the Sierra the climatic changes are more easily understood, being largely influenced by altitude. Above pretty well-defined elevations the precipitation is all, or nearly all, in the form of snow. The moisture not already deposited upon the Coast Range is here condensed, and from early fall until late in summer the summits of the mountains are covered with snow. On not a few of them it lies the year round. This condensation, where the wind coming to the summits comes from the right direction, is immense—the entire snowfall being in some places, as at Summit Station, equivalent to 60 feet of fresh snow. Hence, the necessity for the many miles of snowsheds over the railroad on the Sierra, and for their ponderous strength. There is probably no time when in four or five hours' travel from Sacramento one could not reach banks of perpetual snow.

The melting of snow in summer fills the mountain streams with water, and these, running westward from this range, and those running eastward from the Coast Range, pouring into the Sacramento and San Joaquin Rivers, make the summer floods, which so greatly surprise Eastern visitors. These snow-fed mountain streams are the great supply for mining industries, and they will eventually be of immense value for irrigation. In general, the Sierra country is, in summer, dry, relieved somewhat by the ocean winds that come in and finally reach it through the openings in the Coast Range.

It will, of course, be understood that the uplands of this range have a very low temperature in winter, and in some places during the spring and fall, and even in midsummer, thunder storms are of frequent occurrence.

In all this region the climate is entirely healthful. The dryness of

the air, its extreme rarity in the upper region, the fact that it is charged with the balsamic odors of the pines and firs, the entire absence of any other foreign matter in it, make it indeed a life-giving elixir to all who are suffering from pulmonary difficulties.

This dryness of the atmosphere, which is prevalent throughout the State, except in the little valleys and on the low foothills on the west side of the Coast Range, is a climatic feature of California, which, as will be shown hereafter, is peculiarly advantageous to it as a fruit-growing State. During all the summer there are no sultry days. A temperature of 100° or 110° is here less oppressive than a temperature of 85° or 90° on the east side of the continent. Sunstrokes are here practically unknown. The same is true of rabies among dogs. The exceedingly dry atmosphere takes up the perspiration so rapidly that the system is kept, even at the highest temperature named, if one is only well protected from the direct rays of the sun, cool enough for comfort.

There is one other fact that is peculiar here, and that exercises a wonderful beneficial influence upon our agricultural and horticultural industries. This, together with the causes of the annual precipitation at diverse points in the State, and the probability of rainy, clear, and cloudy days, is ably set forth in the following paper by Lieut. John P. Finley, of the Weather Bureau, which is here given by consent of the author:

"The weather of any place is the sum of its transient meteorological phenomena. To find the sum of such occurrences in California will require more than ordinary calculation. In other words, there is variety in her weather, as there is diversity in her industries. To understand these varying conditions one must consider, at least, the following important general features: (1) The great extent of latitude embraced by the State; (2) its pronounced topographic outlines; (3) its position relative to the North Pacific Cyclone Belt; (4) its relation to the Japan and Alaskan Currents of the North Pacific. To comprehend the meteorology of such a region one must become impressed with the necessity of extending the investigation far beyond the limits of the State. Surrounding atmospheric conditions for hundreds of miles must be closely watched to discover the source of those phases of cloud and sky which make the progress of peculiar systems of circulating air, under the influence of the axial rotation of the earth, which brings over large areas of country changes in temperature and degrees of precipitation, affecting the prosperity of thousands of square miles of territory. You cannot study weather understandingly from your own doorstep.

"Because of California's great extent of territory north and south, she feels the effect of tropical influences as well as those of the temperate zone. Coupled with her varied topography, unequalled in the United States, the fluctuations of atmospheric pressure within the extreme limits of the North Pacific Cyclone Belt give rise to some anomalies in weather both extremely interesting and complicated. Why wonder at the results, with a surface contour affording extraordinary differences in elevation, from nearly 300 feet below to about 15,000 feet above sea-level, permitting variations in temperatures from torrid heat to Arctic cold, and changes in atmospheric humidity from the driest areas on the continent to the saturation of a tropical clime? The most skilled meteorologist will find ample scope for the exercise of his knowledge and professional training.

"Being at one season largely within, and at another largely without, the predominating influence of cyclonic disturbances, introduces peculiarities of weather and climate which distinguishes the meteorology of California from any other portion of the United States.

"The proximity of the two ocean currents, essentially different as to temperature, course of movement, and atmospheric effect, gives rise to a coast climate remarkably at variance with that of the interior valleys, only a few miles away, and still different from the adjacent mountain districts. No State in the Union is so uniquely situated, so diversified as to climate and weather, within such circumscribed limits.

"All the various local and secondary causes are largely subservient to one superior and overwhelming influence—the action of the North Pacific Cyclone Belt.

"The meteorology of the State as a whole, as well as of its individual portions, falls under the sway of this power. The notion must be discarded that the weather of California is not dependent upon atmospheric conditions over adjacent regions to great distances, especially over States to the east and north. This dependence arises from the fact that these adjacent States are nearer, and therefore more strongly affected by the passage of cyclonic disturbances. All of these disturbances enter upon the coast from the North Pacific Ocean. They are huge atmospheric eddies, which have developed in the air, resting upon the warm waters of the Japan Current. The typhoon of the China and Japan Seas becomes, later on in its course, the cyclonic disturbances which sweep across British Columbia, thence to the region of the Great Lakes, and farther on to the Atlantic and Europe.

"All cyclones cross the United States at a lower latitude in winter than in summer. This condition results, in part, from the apparent movement of the sun north and south of the equator, whereby the area of heat and moisture of the temperate zone reaches a higher latitude in summer and recedes to a lower latitude in winter. The atmospheric eddies enter the continent at about the 50th parallel, being about the latitude of the center of the northern portion of the Japan Current, which flows eastward from the Asiatic coast. The fluctuation north and south of the Cyclone Belt of the Pacific Coast depends, then, upon the change in the location of the areas of heat and moisture. These two elements constitute the food of cyclonic disturbances, and without an almost unlimited source of supply areas of low barometric pressure begin to fill up and disappear. Clouds and rain, with boisterous winds, are soon followed by clear, calm weather and a dry, cool atmosphere.

"To understand the distribution of precipitation over any region, one must clearly comprehend the essential characteristics of a cyclonic disturbance. Such information is especially necessary regarding the rainfall of California, for its occurrence and distribution are peculiar and unlike, in some respects, that of any other State.

"As cyclonic disturbances may vary in diameter from 500 to 1,500 miles, and the centers invariably move eastward north of San Francisco, it would rarely, if ever, occur that the whole of any area could be shown on a chart of the Pacific Slope. From the Pacific to the Mississippi Valley the direction is a little south of east. From that river to the Atlantic the course is somewhat north of east. The forms of cyclonic areas are either elliptical or circular, and the former predominate on the Pacific Coast. The isobaric line of 30,000 inches marks

the separation between the two principal classes of atmospheric disturbances, viz.: the cyclone (low) and the anti-cyclone (high).

"An observant 'new arrival' is not long in discovering that California has, during the year, two weather periods, instead of four, known as the 'wet season' and the 'dry season.' He learns that they are powerful factors in ascertaining the prosperity of the commonwealth. When nature, in a kind mood, arranges the relation of these two seasons with a marked uniformity of variations, then Dame Fortune smiles upon the commercial and agricultural interests of the State. If the exact character of these seasons could be forecast in advance, what an enormous profit could be realized! Such long-range prognostications have never been vouchsafed to man, and there is no immediate prospect of his acquiring such extraordinary knowledge.

"We must be content for the present, at least, with a much more limited degree of information, and yet not lacking in practical importance.

"The two meteorological seasons of California are dependent for their proximate occurrence upon the distribution and frequency of cyclonic disturbances between the 40th and 50th parallels, and the rate of progress eastward, together with the energy displayed between the Pacific Coast and the 100th meridian. In short, the cyclones move farther south, and are of greater energy in winter (the 'wet season') than in summer (the 'dry season'). A careful examination of the charts in the office of the Weather Bureau will show very clearly that the weather over any region depends upon the relation of the latter to the quadrants of the passing cyclonic or anti-cyclonic disturbance. According as one or another of the quadrants covers any region, so will be the successive phases of weather therein.

"All forms of atmospheric precipitation are distributed over the earth through the agency of these systems of air circulation. They are of enormous extent and great power, drawing moisture from all available sources, carrying it to great heights in the atmosphere, where, by a marked change in its surroundings, the vapor is transformed into water, and falls again upon the earth. The physical forces of evaporation and condensation cannot fulfill their mission in the production of atmospheric precipitation without the assistance of adequate means for setting up and maintaining a system of circulation for the distribution of the vapor of water throughout the lower regions of the atmosphere.

"It has been found that these atmospheric eddies pursue certain paths over the continent of North America. There are two such lines of travel, one along the northern boundary of the United States, and the other from the West Indies northwestward to the Gulf States, curving at the 30th parallel, north latitude, and moving thence northeastward over the Atlantic Coast States. The second path joins with the first one near Nova Scotia, where, together, they form a well-beaten path, along the 45th parallel, of all cyclonic disturbances crossing to Europe.

"It is a fact to which attention has not been drawn, that that portion of the United States most distant from the influences of the atmospheric eddies which travel the two storm paths embraces what is known as the middle and southern plateau regions. They include southeastern California, Nevada, Utah, Arizona, New Mexico, western Colorado, and southern Wyoming. This may be called the dry region of the United

States. It is well known as the region of least rainfall, and has been found to be the region over which the greatest atmospheric evaporation (about 100 inches annually) takes place. There can be no doubt but the meteorology and the climatology of this region depend most largely upon its geographical position regarding the cyclonic belts over the United States. California's share in this relationship cannot be understood without a comprehensive and graphic view of the whole situation.

"The reader must already begin to see some evidence of the preponderating influence in the distribution of precipitation over the United States, and especially the Pacific Slope. Of course all general and predominating influences are counteracted here and there by local differences, which, in this discussion, may be briefly referred to as topographical. The limits of this paper will not permit of considering this branch of the subject particularly. The tabulated data given herein will illustrate some of the effects of local surroundings. The dry region of the United States can never be other than it is, so far as atmospheric conditions are concerned, without a great physical change, which would completely reverse the circulation of the Japan Current in the North Pacific Ocean, and bring it nearer the California coast. It must needs bathe this coast, as does the Gulf Stream the coast of the South and Middle Atlantic States. Then would the dry region become, in weather and climate, and in vegetation, as that of the Gulf and South Atlantic States.

"We find that the weather of California, like that of any other region, is dependent upon the atmospheric conditions surrounding it for hundreds of miles. If it were nearer the Cyclone Belts, its two famous seasons, the 'wet' and the 'dry,' would be changed into a more uniform distribution of precipitation throughout the year, and a less uniform distribution of temperature. Such a modification of its climate would be detrimental to some of California's greatest industrial pursuits. Its variety of weather and climate is unrivaled in the United States, and therefore the peculiar adaptability of the State for the growth of the choicest fruits, grasses, and cereals. Its geographical position is such that the seasonable fluctuations of the North Pacific Cyclone Belt carries the rain area far to the north, and protects the crops that would otherwise suffer severely from heavy cloudiness and drenching rains.

"The precipitation of the 'wet season,' when the Cyclone Belt takes a more southerly course, is generally heavy; and there is stored in the earth a supply of moisture that frequently goes far toward supplying the needs of summer. When this source fails resort must be had to either surface or sub-irrigation. But the 'dry season' in California does not mean an entire absence of rain throughout the State. Rains occur on the northwest coast from San Francisco northward, and in the mountains in the northeast and southeast portions during the summer. They are frequently heavy, with thunder storms in the southeast portion. The central valleys are the driest in summer, especially in July and August, where, in some places, no rain falls during these months for a period of several years. In any case only the slightest showers would occur, at long intervals, resulting from the drifting over and settling down into the valleys of heavy clouds from the mountains. Such precipitation is likely to occur when the snows of the previous winter have been heavy and the mountains remain snow-capped throughout the year.

"The average rainfall values at selected stations in California are

shown in Table No. 1. Records are given from both the regular weather stations and those where the observations were made by voluntary observers. By such selection a better idea can be given of the distribution of precipitation over the State.

"As average values do not give an idea of the extremes, I have added an extra column to show the greatest seasonal amount reported, with date of occurrence. An examination of this table will show what marked variations exist between summer and winter rainfall. It will also call attention to the fact that even the 'wet season,' with its southerly trend of the Cyclone Belt, fails to produce adequate precipitation for southeastern California. The values in this table will not show, satisfactorily, the average depth of snowfall in the mountain districts, a very important factor in forecasting the rains for July and August, and ascertaining the probable water supply for irrigating purposes. Some idea of the distribution of this form of precipitation can be obtained from the selected stations, Tehachapi, Summit, Colfax, and Susanville. Heavy snow in the mountains in winter, will probably result in heavy rains in the valleys in summer. The enormous extent of surface covered with snow, from a few inches to many feet in depth, offers an extraordinary opportunity for rapid evaporation under the burning rays of the morning sun through a clear, crisp atmosphere. Heavy clouds appear over the lofty ranges by about 12 noon, and when the sun begins his downward course, and the air currents are pushing down the mountains, great masses of clouds are hurled together and carried over the valleys, attended by smart showers and occasional manifestations of atmospheric electricity.

"Here we have a brief view of the conditions under which summer rains occur in the mountain districts of California, especially in the southeastern portion of the State, and the adjacent regions of Nevada and Arizona. Even these may be called cyclonic rains, for they invariably occur under the influence of a barometric trough of low pressure, covering the eastern portion of the Pacific States, the center of the cyclonic disturbance being in British Columbia, north of Montana. The effect of this trough may not disappear until the central area moves eastward into Dakota and Minnesota, like a monstrous sea serpent dragging his tail behind him.

"A low barometric pressure is especially favorable to evaporation and the development of ascensional air currents, which force great quantities of vapor into the air that is rapidly condensed into clouds. Clouds consist of small drops of water light enough to float in the air. Fogs are clouds resting upon or very near to the surface of the earth. When the drops of water become large enough and sufficiently heavy to fall to the earth they are called, collectively, rain. I have quickly depicted here the transitions from water into the liquid and solid state, through the vapor or gaseous form, to the liquid state again. What a powerful engine is the atmosphere, and how nicely adjusted must be all the cogs, wheels, springs, and compensations of this exquisite piece of machinery, that it never wears out nor breaks down, nor fails to do its work at the right time and in the right way.

"The effect of the fluctuation of the North Pacific Cyclone Belt is also shown in the probability of rainy days for various parts of the State (see Table No. 2), and in the percentage of clear and cloudy days as given in Tables Nos. 3 and 4. It will be noticed that the probability of

rain for the valleys is proportionately much lower in summer than the probability of cloud formation. This is largely due to the fact that while the northward deflection of the Cyclone Belt is sufficient to prevent rain, it does not remove the influence of cyclonic circulation in the production of cloud formation. At times the sky will remain overcast for several days, and pass away without precipitation. The condensation has not been sufficiently vigorous under cyclonic circulation to develop drops of water of sufficient size to fall to the earth.

"These tables furnish interesting and valuable data for comparative climatic study, and show the importance of systematic meteorological investigation. Perhaps very few of my readers will be able to realize the vast amount of labor in computations, and the long years of constant watching secretly represented in this little collection of figures. It is a patient, but determined study of nature, who refuses to reveal herself without the most ingenious and prolonged effort of man.

"No portion of the United States offers richer opportunities for meteorological research, or will afford greater practical results from thorough and systematic investigation, than the weather and climate of California. No State is in greater need of such scientific inquiry; and if successfully prosecuted it will greatly aid in the development of her rich resources. It will bring them to the attention of thousands who would be glad to enjoy the fruits of 'perpetual summer;' the opportunities of a wonderfully varied climate and soil; the invigorating influence of unsurpassed mountain air and scenery; and the advantages of marked uniformity of temperature along a coast-line of marvelous extent and diversity.

"Theoretically, California should furnish the best and most varied health resorts and sanitariums in the United States. Within her borders most every form of wasting disease should find the means of temporary, if not permanent, relief.

"While our present knowledge warrants this assumption, yet practically the truth of this statement, in all necessary details, must be developed and tested by adequate scientific research.

"The agricultural, horticultural, and commercial interests must be more fully informed as to the probabilities before them, and every line of industry afforded the means of weighing thoroughly its chances for growth and success.

"A reliable knowledge of probable weather changes and of climatic effects is rapidly becoming a daily necessity in all occupations.

TABLE No. 1.
Monthly and Annual Average Rainfall, in Inches, at Weather Bureau Stations in California, from Records for Many Years.

Stations.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.	Maximum Seasonal Amount.
San Francisco	5.06	3.76	3.07	2.04	0.82	0.15	0.02	0.02	0.16	0.85	2.85	5.20	23.80	49.27—1861-62
Eureka	7.63	6.61	4.55	4.15	2.05	1.07	0.10	0.02	0.73	2.73	3.95	7.25	39.50	73.90—1889-90
Red Bluff	5.97	3.87	2.84	2.18	0.78	0.37	T.	0.05	0.41	1.22	2.84	3.76	23.99	61.65—1877-78
Sacramento	3.77	2.89	2.86	1.95	0.69	0.13	0.03	T.	0.11	0.68	2.08	4.52	19.69	36.36—1852-53
Fresno	1.30	1.21	1.21	1.64	0.30	0.13	0.00	0.00	0.12	0.39	1.21	1.28	8.79	16.62—1885-86
Keeler	0.25	0.54	0.24	0.64	0.41	0.22	0.17	0.10	0.27	0.27	0.18	0.38	3.67	5.76—1887-88
Bitwell	4.24	2.71	2.25	1.68	1.37	1.13	0.31	0.20	0.38	0.96	2.08	3.46	20.77	37.20—1866-67
Los Angeles	3.93	3.76	1.90	1.34	0.35	0.09	T.	0.08	0.01	0.35	1.49	2.73	16.03	32.16—1883-84
San Diego	1.55	2.22	1.38	0.90	0.44	0.07	0.01	0.19	0.03	0.29	1.02	2.16	10.26	25.97—1883-84
Yuma	0.37	0.48	0.20	0.11	0.04	T.	0.15	0.45	0.15	0.12	0.36	0.38	2.81	5.86—1884
Other Stations.														
Fort Gaston	10.56	7.99	7.50	4.70	1.74	0.75	0.12	0.11	0.89	2.67	7.69	10.70	55.42	125.36—1865-66
Crescent City	13.69	10.44	6.29	8.58	2.75	2.31	0.65	0.08	3.49	10.22	11.37	13.90	88.77	113.45—1881-82
Nevada City	10.93	7.68	8.57	5.14	2.06	0.60	0.04	0.03	0.54	1.82	6.77	12.09	56.27	115.26—1867-68
Mammoth Tank	0.19	0.43	0.09	0.11	0.02	0.00	0.06	0.13	0.03	0.14	0.16	0.49	1.85	3.11—1883-84
San Bernardino	3.66	3.03	1.97	1.75	0.44	0.06	0.02	0.08	0.05	0.43	1.58	3.10	16.17	37.51—1883-84
Campo	2.36	2.80	2.38	2.58	0.27	0.05	0.60	0.37	0.01	0.41	1.13	2.21	15.17	19.63—1882-83
San Luis Obispo	4.68	3.75	2.81	2.05	0.35	0.14	T.	T.	0.03	0.72	1.95	4.53	21.01	42.40—1883-84
Tehachapi	1.28	3.54	1.63	1.83	0.38	0.13	0.01	0.09	0.03	0.42	0.73	1.62	11.64	18.77—1883-84
Summit	8.39	8.96	6.78	5.77	1.68	0.62	0.08	0.01	0.19	2.34	2.82	7.32	44.96	87.96—1879-80
Colfax	8.36	6.77	6.28	4.97	1.63	0.52	0.00	0.00	0.32	1.74	5.06	7.67	43.33	89.80—1889-90
Susanville*	8.86	5.48	5.53	1.35	4.49	0.60	0.03	0.07	0.08	2.09	1.89	9.84	39.42	

* Record for only two years.

TABLE No. 2.

Monthly Percentages of Probability of Rainy Days at Weather Bureau Stations in California, from Records for Many Years.

Stations.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
San Francisco	38	38	31	25	11	8	2	1	5	11	22	34
Eureka	50	43	37	34	21	17	3	2	11	29	35	46
Red Bluff	34	32	28	29	17	11	2	1	6	12	25	34
Sacramento	31	31	29	25	9	5	1	1	4	11	18	31
Fresno	22	25	19	22	8	3	1	1	3	8	15	20
Keeler	10	14	9	17	9	4	7	4	4	5	14	8
Bidwell	44	40	29	27	32	31	13	4	6	12	38	45
Los Angeles	18	23	24	21	9	5	1	1	1	7	11	17
San Diego	19	25	22	19	11	5	2	2	2	7	10	17
Yuma	5	7	4	3	1	1	3	9	3	2	4	7

TABLE No. 3.

Monthly Percentages of Probability of Clear (Sunshine) Days at Weather Bureau Stations in California, from Records for Many Years.

Stations.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
San Francisco	52	54	54	58	60	60	60	57	66	68	62	53
Eureka	47	59	52	44	55	61	72	83	76	60	55	50
Red Bluff	55	57	61	60	65	80	90	94	89	79	66	52
Sacramento	58	67	65	66	76	86	95	97	91	83	72	65
Fresno	57	55	62	60	76	89	96	98	94	84	76	53
Keeler	73	75	74	74	79	89	85	89	90	86	75	74
Bidwell	42	53	51	54	53	58	82	84	83	69	50	43
Los Angeles	68	63	58	53	57	61	71	75	77	74	74	69
San Diego	61	59	52	54	46	50	53	60	62	61	65	63
Yuma	76	78	78	84	88	92	83	78	90	88	81	80

TABLE No. 4.

Monthly Percentages of Probability of Cloudy Days at Weather Bureau Stations in California, from Records for Many Years.

Stations.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
San Francisco	48	46	46	42	40	40	40	43	34	32	38	47
Eureka	53	41	48	56	45	39	28	17	24	40	45	50
Red Bluff	45	43	39	40	35	20	10	6	11	21	34	48
Sacramento	42	33	35	34	24	14	5	3	9	17	28	35
Fresno	43	45	38	40	24	11	4	2	6	16	24	47
Keeler	27	25	26	26	21	11	15	11	10	14	25	26
Bidwell	58	47	49	46	47	42	18	16	17	31	50	57
Los Angeles	32	37	42	47	43	39	29	25	23	26	26	31
San Diego	39	41	48	46	54	50	47	40	38	39	35	37
Yuma	24	22	22	16	12	8	17	22	10	12	19	20

CHAPTER IV.

HORTICULTURAL HISTORY.

The horticultural history of California can be briefly written. The horticulture of the Missions comprises the first period. The first records of horticulture note that as early as 1701-07, Father Ugarte caused the desert to blossom as the rose by the culture of a piece of rich soil at St. Xavier in Lower California. In the latter year he was eating bread of his own raising, while New Spain was suffering from drought. He also is said to have made more wine from the vineyards he had planted than was wanted for Mission use, and to have exported small quantities to Mexico, an early beginning of the wine shipments from this coast.

California proper was not occupied by the whites until many years later. In 1767 the Jesuits were driven from the Missions in Lower California, and everything they had was turned over to the Franciscan monks. Junipero Serra was selected as the President of the Missions, and set out for his field of labor. The Dominicans clamoring for a share in the Mission work, a division was made, and in 1769 the Franciscans started northward, entering upon and occupying what is now the State of California. José de Galvez, Visitor-General, and secular head, representing the king, with Father Serra, proceeded to make arrangements for the establishment of new settlements. Galvez seems to have been far-seeing, for in the manifests of the vessels sent it is found that he had caused to be shipped to Alta California, flower, vegetable, and fruit seeds, for garden and orchard, and grain for the field. Twenty-one Missions were established, all but three of which had gardens and orchards.

Thus, in the very early days, we find introduced the olive, the fig, and the grape. The trees were grown chiefly from seed, and were probably all, or nearly all, seedlings. Of these, there are three that have been perpetuated, namely, the Mission olive, the Mission grape, and the black fig, now designated as the Mission fig. In 1792 there were growing near the Mission San José, apples, pears, apricots, peaches, and figs; and at San Buenaventura, in addition to these, oranges, limes, grapes, olives, and pomegranates. At this time there were in the several Missions about five thousand bearing trees. This was, of course, a very small number, but these trees play an important part in the horticultural advancement of the State. They showed the possibilities in fruit culture, and furnished seeds, stock, cions, and from the vineyards, grape cuttings, for many orchards and vineyards.

Fruit culture in early days in California was incidental. That it would ever become the chief industry of a great Commonwealth was not then dreamed possible. The Franciscan fathers when they brought a few seeds with them did so in order that they might have some of the fruits they had enjoyed in their native land for their own tables, not for the purpose of cultivating orchards for the benefit of others, or for producing fruit for sale. Their efforts were devoted to the building up of their Missions, increasing the number of their adherents, and enlarging the herds in which the wealth of their Missions lay. The hides and tallow of the numerous herds that in those early days ranged the almost sterile plains of California were the only source of wealth possessed by its sparse population.

After the occupation of the southern part of the State by the Franciscans the Russians penetrated from Russian America southward, and as early as 1812 planted an orchard of mixed fruits at Fort Ross, in Sonoma County. This was a trapping settlement at that period, and consisted of some twenty-four houses, and the fruits comprised apples, apricots, pears, cherries, and vines. The property passed afterwards into the hands of Captain Sutter. Some of the apple trees are still bearing fruit, but the other trees are dead.

The Russian orchards, like those of the Mission fathers, were not planted from a commercial consideration, but to supply their respective owners with fruit for home consumption.

Outside of the Missions there were a few attempts at horticulture. General Vallejo planted an orchard at Sonoma as early as 1830, and there was the apple orchard at Fort Ross already mentioned. General Bidwell speaks of it as bearing in 1842. He also says that at Mission San José there were about six acres in orchard and vineyard in 1841, besides others at Santa Clara, and what is now San José. Orchards and vineyards were planted in Los Angeles, and on Putah Creek, in Yolo County, as early as 1845. These were planted by the Wolfskills, and many of the trees are now standing and in bearing. This covers what might be called the "prehistoric" horticulture of the coast.

In 1849, when the gold fever broke out, no thought was given by the majority of those who came here to anything but gold mining. True, a few men, perhaps not quite so adventurous as the others, or not so impatient for immediate gain, got possession of some of the orchards, took reasonably good care of them, and afterwards found that, with fruit in demand at from 50 cents to \$1 a pound, they, too, had a "mine."

Beginning at this period, there have been three distinct eras in the development of the State. The first was the gold-seeking era—the type of which was a buckskin sack, in which the dust was carried, and from which it was measured out in pinches at so much a pinch. This continued for many years. But the cost of sustenance was so great that thoughtful persons, observing the possibilities of soil and climate, cast about for a way of reducing this cost, by growing the necessities of life here. Then the second era, the era of grain culture—its symbol a grain sack—was introduced. It was soon discovered that by good culture, if the season was favorable, in almost any part of the State enormous crops of grain could be raised. There were favored localities found, where, almost without regard to season, crops could be secured. To grow grain, and make large profits—and nothing short of this would satisfy the early Californian—large tracts were necessary; and the large holdings, that have so hindered the healthful advancement of the State, resulted from this grasping after land. For a time it was thought that grain growing and grazing were the coming industries, and that the prosperity of the State would be far greater under this regime than from mining. The end, however, was not yet. There has dawned a new era, the era of fruit culture—its symbol a fruit box. The result is that the grain fields are being planted to vines and trees; that cattle and sheep ranges are being subdivided, and the available parts broken up and planted. The last twenty, even the last ten years, have wrought a miracle upon the face of our land.

In the second period of our horticultural history, fruit culture was still a very minor consideration—a very small incident in the history

of the lives of the fortune hunters who poured into California in search of the glittering ore which was to enrich them. A few men not wholly weaned from the memories of their Eastern homes, brought with them across the plains or the isthmus, seeds of choice fruits from the old orchards. These were planted, flourished, and bore fruit around the miners' cabins. Others seeing the great demand for fruit—an article exceedingly scarce in those early days, when an apple or a peach would sell for a dollar or more—thought there was a mine of wealth in an orchard; and trees were procured from Oregon or the East at great cost and planted in the old mining camps, where the oldest orchards are now found. This was the commencement of the fruit industry, as a business, in our State. Many of these old orchards exist to-day, but with the decadence of the mining industry, they have been neglected, and to-day cut no figure in horticultural importance. They were, however, the pioneers of the industry, and proved that California would excel in fruit growing as she has done in all else. The discovery of gold was speedily followed by the planting of fruit, and as early as 1848, Peter Weimer, an employé of James Marshall, at Coloma, in El Dorado County, planted some apple seeds procured from dried fruit imported from the Eastern States, and from this source, in a few years, had an apple orchard, which yielded him good returns for many years after.

The first peaches grown and marketed in California, so far as known, were raised by A. P. Smith, on the American River, and sold by W. R. Strong, then a fruit dealer in Sacramento, at \$1 50 and \$2 each. The first apples found in the California market were imported from Chile in 1852, and sold at 75 cents per pound. The first apples grown in the State were raised by A. P. Smith, of Sacramento; Briggs Bros., of Marysville, and a Mr. Lewelling, of San Lorenzo, Alameda County. Which of these takes precedence it is difficult to state, as all were engaged in fruit growing at the same time and rank as the pioneer orchardists of the State.

For many years, fruit growing in California was largely experimental. People came here from the East with ideas acquired under Eastern conditions, and they planted Eastern varieties and followed Eastern methods. Orchards were generally small in extent and mixed in variety. Experience in time demonstrated what varieties of fruit were best adapted to our State and to the different parts thereof. The nature of our soils and peculiarities of our climate were learned, varieties especially adapted to peculiar conditions were discovered or produced, and fruit growing in California became a science as well as a business. The difficulties that beset its early history were overcome, and at last horticulture, established upon a secure footing, made such rapid strides that in a few years California rose from an insignificant place among the fruit-producing States of the Union, to become the orchard of the United States.

While early in the fifties there were numbers of small orchards, it cannot be claimed that the fruit industry existed as a business until twenty years afterwards. No one in those early days dreamed of growing fruit for export, nor would any one have believed that it could ever be done, and no systematic fruit growing to any extent was attempted. The orchards were, as a rule, accessory to more important pursuits—not the principal pursuit as they are to-day; and it was not until 1870

that fruit growing in California became established as an independent business.

The completion of the railroad to the Eastern States very largely assisted in its growth. For while there was little fruit shipped East for several years after the completion of the road, a demand for California fruit sprang up along its line, and gave an impetus to the new industry. The demand has since that time continually increased and spread, until to-day the orchard industry of our State leads all others, and California ranks first among the fruit States of the Union. The industry is a rapidly growing one, too, and the next five years will see the output of the State doubled. Our fruits to-day, in various shapes, green, dried, canned, preserved, and manufactured into jellies, raisins, wines, and brandies, are shipped to every corner of the world. With the increase of our output, and the larger demand for our products, there has been a steady decrease in freight rates, until they are to-day but little more than one third of what they were in 1871.

As showing the rapid growth of the orchard industry in our State in the past two decades, the following table is appended:

Year.	Fresh Fruit— Pounds.	Dried Fruit— Pounds.	Raisins— Pounds.	Canned Fruit— Pounds.
1871	1,832,310			
1872	2,039,972			182,090
1873	2,896,530			678,580
1874	5,029,840		220	457,290
1875	2,993,720	548,227		759,040
1876	4,201,730	630,770	68,440	1,529,910
1877	3,818,310	730,710	239,260	1,731,530
1878	2,866,420	259,170	192,890	1,700,930
1879	3,126,400	1,761,750	942,770	3,111,680
1880	3,141,500	412,480	661,660	6,707,650
1881	7,248,300	2,074,420	1,490,320	18,768,200
1882	7,919,340	4,532,350	865,770	25,163,190
1883	19,222,580	3,097,950	295,050	26,397,700
1884	11,996,070	2,102,350	3,150,290	21,695,740
1885	45,386,740	5,794,160	6,203,340	28,949,380
1886	49,685,650	6,113,970	12,970,800	30,636,710
1887	50,732,990	16,648,520	15,976,500	56,009,130
1888	53,741,670	19,759,140	16,884,570	39,281,340
1889	50,053,050	33,132,050	39,313,740	37,083,725
1890	68,084,124	64,595,181	41,120,330	80,121,950
1891	98,680,100	65,090,220	44,954,850	49,566,680

The figures given are those of the Southern Pacific Railroad Company, except those for 1890 and 1891, which represent the amount carried by the Santa Fe and Southern Pacific systems.

There was shipped by sea, in 1891, 15,223,440 pounds of fruit.

The vast importance of the fruit industry at the present time cannot be better shown at a glance than by a summary of the fruit shipments out of our State in 1890. This is shown as follows:

Total carloads, all kinds, Southern Pacific Company	11,948
Total carloads, all kinds, Santa Fe system	4,246
Total pounds, all kinds, both systems	323,915,185
Total carloads by both systems	16,194
Total cars for each day of the year	44
Total carloads shipped in 1880	546
Excess in 1890 over 1880	15,648

The total carloads of both systems during the year 1890 would make a solid train of cars 123 miles long.

The future importance of the industry can be estimated by its growth in the past. In twenty years our shipments have grown from nothing to 20,706 carloads in 1891. At the present time not over 25 per cent of the orchards planted are in bearing, and not over 5 per cent have reached their maximum. Taking round numbers, and placing the output at the lowest figures, the conclusions reached are startling. We have now in the State at least 200,000 acres in orchard. This will all be in bearing in five years, and allowing 100 pounds to the tree—a small estimate—and we get the following figures:

Acreage now planted	200,000
100 trees per acre	20,000,000
100 pounds to the tree	2,000,000,000
Tons	1,000,000
Carloads	100,000

Who dare say that the era upon which we have now but entered shall not lead our State to a far higher condition of prosperity than she has yet reached? While mining for the precious metals will still continue, yielding its millions for the State, and while grazing and grain growing will always be largely followed (for all healthful industries continually overlap), fruit growing is destined to be the great interest of California, and for the millions that either of the other industries may bring it will show its tens of millions.

IMPORTANCE OF HORTICULTURE TO CALIFORNIA.

The advantages of this industry to the State can hardly be overestimated. When it is stated in bare figures that so many millions of pounds of fruit have been exported, and that so many thousand dollars have been brought into the State in exchange therefor, however great the showing may be, the half has not been told. Horticulture is most emphatically a home-making industry. One needs but to contrast the condition of certain localities in Central California, as they are, with what they were a few years ago, to realize what a change can be made by this industry even in a few years. Then, for many months of the year, the country seemed a barren waste, with here and there great bands of sheep or cattle, eating grass, flower, and shrub, until the picture was one of sheer desolation. A few uncouth vaqueros with their wild mustangs and wilder ways, were about the only human beings to be seen. Houses were separated by leagues of distance, and when one was found it stood in some bleak place, where the desolation was seemingly greater than in the open fields. A great corral, a broken-down shed, where refuse was cast, perhaps a windmill to furnish the water, a number of fierce looking dogs, and that was all.

No garden, no vineyard, not even a tree or shrub to keep off the fierce rays of the summer sun. In fact, there was nothing that had, even in a remote degree, the semblance of a home. And though it were a grain ranch, there was but little difference. In the growing season there was a period during which the restful green of the waving crops delighted the eye, and later, when the golden color foretold the harvest of gold; but during the rest of the year the same desolation was apparent. Houses few, small, and far between. Nothing approximating a neighborhood, no church, few schools, and these necessarily so far from most of the dwellings that the children reached them on horseback; and of

course, little or no opportunity for social culture or the refinements of life.

Around the dingy houses, lying uncovered during the entire period when not in use, were the plows, the harvesters, and the other implements necessary in planting and securing the crop. A few cabins, perhaps, where the "blanket men," employed for a few weeks during harvest, could store themselves, and little more. Neither of these is an inviting picture, but they show California as it was for many years under the second era.

There were, of course, exceptions. Here and there, at very great intervals, a *home* would be found—a plain, but tasteful residence with comfortable outbuildings, a small, thrifty garden, a family orchard, and several of the other belongings of civilization. But even here there was almost an entire lack of companionship; there was properly no community. It is a wonder that so many good men and better women lived so long in this isolated manner.

But by far the most deplorable effect of these phases of life was seen in the children reared amid such surroundings; and the children of one day are the men and the women, the citizens, of a very near to-morrow. To the boy only one avenue was open—the life of a vaquero. His pony carried him to school, and became his closest companion. He early learned to "throw a rope," and accompanying this there were other lessons in language and habits—such lessons as are not conducive to either manliness or honesty. The ideal constantly before his eyes was, too often, a mustached man, wearing a broad-brimmed sombrero, buckskin trousers with fringed seams, jingling spurs, a Mexican saddle, with rawhide lariat so attached that it could be loosened in an instant and used as a lasso. His ambition was to be such a man, to smoke cigarettes, swear, carry a couple of revolvers in his belt and a bowie knife in his boot. This was the embryo man of the coming California. And the girl reared here—God pity her—what could she look forward to in the future? It seemed all a blank until she should be old enough to think of a vaquero lover, in his best cowboy attire. This might be her career, or she might possibly become so worldly-wise that, conscious of the powers of her charms, she resolved to win a rich husband who would remove her at once and forever from her unpleasant youthful surroundings.

This picture of what California was, and what some of it now is, is not overdrawn. But all this has changed where horticultural pursuits are in the ascendant. Even the face of the country has changed. It now is finely diversified by vineyards and orchards, different varieties giving off different shades and tints, until the picture is one pleasant, indeed, to behold. These different shades of green last all through the spring and summer, until the richer, clearer hues of autumn and winter take their place. The look of desolation is no longer there. Houses have sprung up as if by magic, for successful fruit raising means small holdings. It requires no gift of prophecy to foretell that in the near future the man who raises his product on a small tract, upon which he and his own family can do the whole work, will be the man who will achieve the greatest success. These houses put on the characteristics of a home. There is a flower garden in front, a family garden and orchard in the rear; there are neatly kept fruit houses, and storehouses for implements that must be well cared for; there is everywhere the appearance of

thrift. There is now a neighborhood; social intercourse is easy; schools so near, and because now they must be; so good, that every child may receive their benefits. Churches and assembly halls, and even public reading-rooms are found, and society has, in a marked degree, put on the garb of civilization.

But more than this, in this home-making every member of the family has his part. There is the opportunity, and fortunately many times the necessity, for pleasant and more or less constant work for all who are able to work. Instead of the family being made up of one producer, and all the rest merely consumers, here all are producers. Whenever and wherever this is the case prosperity reigns. The children here may be, and should be, trained to habits of industry, habits of thrift. This gives to both the boy and the girl a purpose in life. There is something to do, and therefore something to be. Associations upon the plane of a common industry are among the most pleasant in life. And these associations, easy now because neighbors are near, tend to give to the children a culture and a refinement rarely seen in other communities.

Successful horticulture requires the quick eye, the skilled hand, and the trained intellect. It is not mere groveling labor, but, in the main, intelligent, inspiring work. The good effects of introducing children pleasantly to an industry of this kind are apparent to every one who has had the opportunity to observe them. The aim to be an intelligent, successful fruit grower, or to be the center of a cultured home in a rural community, where all the necessities and many of the luxuries of life are at command, will be far more likely to lead the children to a higher and better life, than the purposes that actuate children reared under different circumstances.

The fact that success in horticulture depends so largely upon the intelligence of the operator, and that there is a constant need for reaching out, in all its departments, for more knowledge, makes it an exceedingly attractive occupation for persons of some culture. As a result of this, it will be found that our fruit growers are, as a class, men of brains, and men who have, if not already wise in their particular department, both the inclination and the ability to acquire rapidly the necessary amount of information. The mind as well as the hand must be kept ever busy. That such men are mainly in charge is abundantly indicated by the manner in which our orchards are kept and handled. Fruit growers from the East are always surprised at our clean and thrifty orchards. A slovenly kept place is an exception. The inculcation of habits of neatness and of order, all of which become necessary to success in horticulture, is not one of its least advantages.

So far, it has not been enumerated as one of the benefits of horticulture that it increases the income per capita, or that it largely increases the assessment roll in any county. These are both true, and these increases are far greater than most people imagine. But what is said here has been written to show that there is a prosperity that does not appear upon the tax roll and an advancement that can never be estimated in mere dollars and cents. It is this higher prosperity, this truer advancement, as well as the other, that horticulture is bringing to our State. In the not very distant future, when our fruit-growing area shall be subdivided, as it will be, into thousands of small holdings, and on each of these shall be found a cultured, happy, and industrious family, then

we shall have reached the truly golden age. It is rapidly coming and nothing can stay its progress. Then, instead of being noted chiefly for its "wild and woolly ways," or for its large pumpkins and larger stories, California will be celebrated as being the home of the most enlightened, progressive, and happy people in the world.

HORTICULTURAL ADVANTAGES.

California's first great advantage comes from its geographical position. An ocean-bound length of nearly 800 miles, other conditions being such that there is but little marked difference in temperature, and of a width varying from 50 to 150 miles, before reaching the barren portions of the Sierra, give an area so extended that it may well be called an empire.

A very large portion of the entire Coast Range is admirably adapted to horticulture. From the little plains bordering, in places, on the ocean, the horticulturist has been gradually creeping up the foothills, until, in many places, the very summits have been reached, and all through this area he has found excellent fruit land. Indeed, it has been found here, as upon the valley side, that the fruit grown upon the foothills and mountain tops is superior in flavor, and often in size, to that grown in the valleys. Through all this region the apple, the pear, the plum, the prune, the cherry, the olive, and the fig are grown in great luxuriance. Except upon the very summits, where the sometimes semi-ocean winds, in blossoming time, interfere, the apricot, the nectarine, and the peach find a congenial home, while the grape does almost equally well in all parts of the State.

Toward the south the orange, the lemon, the lime, and even the banana, are successfully grown, while the nut-bearing trees thrive wherever they have been planted throughout the entire extent. On the coast the temperature is more equable than in the interior valleys, and during the growing season the fruit is frequently bathed in the ocean fog. Fruit grown here differs in many respects from that grown more inland, and is often several weeks later.

The coast-belt fruit area comprises the Coast Range, including the foothills on both slopes. The northern part of this is, as yet, somewhat inaccessible, and has therefore been but little tested, but the characteristics can differ but little from those of the southern part.

The soil is, throughout the entire extent, remarkably fertile. The very summits are in many places covered with a deep black sandy loam, the ideal soil for fruit. Upon the slopes may be found every variety of soil, as there is of exposure. To determine the kind of fruit, and the varieties that will thrive best in a given soil, and having a given exposure, requires the exercise of great judgment, and only by careful experiment can all the questions that arise be settled. The fact that such problems are constantly arising, upon the solution of which success or failure largely depends, renders it necessary that one who would succeed in horticulture must be a close, thoughtful student.

The rainfall in this ocean belt is everywhere abundant, and irrigation, except in the southern portion of the area, largely unnecessary. An exception to this may be made in reference to citrus fruits, and, of course, to berries and other small fruits.

In the great inclosed valley, the advantages are of a somewhat different nature. The temperature, except in certain favored localities, is

not so equable, the rainfall not so great, nor is there, in the valley proper, the opportunity for selecting the exposure. The soil is abundantly fertile, and responds generously to good culture; the rainfall in most places sufficient, and where not, water is easily obtained, either from artesian wells or mountain streams. Nowhere in the valley, nor on the western hills—not until the upper Sierra is reached—is it ever cold enough to kill peach or apricot trees. The orange and other citrus fruits thrive as far north as Butte County, and are grown in protected places even in Tehama and Shasta.

In this valley, and the lower foothills on either side, peaches, nectarines, and apricots are more productive than upon the Coast Range, and the fruit, in most cases, of better quality. The apple does not do so well, the fruit lacking flavor and consistency, but pears reach great perfection. Here is the home of the raisin, and all the finer varieties of grapes make luxuriant growths.

The second marked advantage possessed by California is that our trees and vines begin bearing at an earlier age, and bear uniformly more abundant crops than do trees and vines in any other locality. This fact can be easily verified, by even a casual observance of our fruiting fields. The two conditions of soil and climate seem to be in accord to produce this result. It is not an uncommon thing to see a two-year old peach orchard or vineyard carrying crop enough to add materially to the income of the grower; and a statement of the number of pounds of fruit grown upon our older vines, and upon our well-developed prune or pear trees, even when entirely within the limits, is apt to be received with incredulity. One of the causes of this productiveness is discussed hereafter.

The third advantage is the quality of our fruit. Well-grown, well and naturally ripened California fruit is of a better quality—making quality dependent upon texture and flavor—than that raised upon the Atlantic slope. Our mountain apples—those from Humboldt, Lassen, Modoc, Del Norte, and Siskiyou Counties—are not to be excelled.

In the very nature of things this must be so. All through the growing season our fruits are having forced into them, from the root development of the plant, their nutrition. The exceedingly dry summer air is constantly extracting the moisture from the fruit through the skin, leaving behind the pulp, the saccharine matter, and the peculiar fruity flavor. The product is thus more concentrated than is that grown under other conditions. To realize this more fully compare a box of peaches dried at Fresno or Marysville with a box prepared anywhere on the South Atlantic slope. The peaches in one case will be light-colored, plump, flexible, having a distinct and strong peachy odor, and the skins will be nearly devoid of the thick downy covering so unacceptable to the palate. The other will be dark, hard, with a bitterish odor, if any, and the skin will be tough and covered with a thick resistant fuzz. This is caused not so much by a difference in preparing and handling as by a difference in original growth. Our inland counties produce a peculiarly characteristic fruit. In fruit grown upon the west side of the Coast Range this characteristic is by no means so apparent. California prunes and California raisins, for the reasons given above, have won and will continue to win unqualified approval wherever well known. No reference is here made to size, as that point—not always a point of excellence—is conceded.

Scientific research has developed and abundantly confirmed the fact that the highest degree of perfection in ripening most fruits is reached only in abundance of sunlight. The long period of continuous sunny days during the ripening time gives to California a peculiar advantage, probably possessed by no other place. And if the sugar secretion and luscious flavor are induced, as they probably are, by the action of the actinic or chemical rays, then the clearness of the atmosphere and its freedom from moisture contribute largely to the same results. The same reasons that enable our photographers to make such superior pictures, are, in the same way, giving us superior fruit.

The peculiar hot-bed nature of our coast is another advantage that we possess. The effect of this is shown in early production, in great crops and enormous size, and also in the luscious quality of the product. A more marked exemplification of this is observable in matters of propagation: Grape cuttings stuck into the ground with any kind of care, root readily; many varieties of pears, some of the prunes, and, in short, anything that will "strike" in an ordinary propagating house, will root here in the open air. The conditions are all the same, except the covering to retain the moisture. It is again shown in the effects of frost—for frosts do occur here. A frost that "on the other side" would kill all the tender vegetation, is here harmless, its effect being, in whole or in part, neutralized by the radiant heat. Nothing surprises an Eastern visitor more than this.

The great advantage we have in gathering and handling our product is very pronounced. The rainless season, the dewless nights, and the dryness of the air, make it possible to leave our fruit outside without protection, and with little if any fear of molding. For drying, our climate is unsurpassed. During much of the drying season, in favored localities, fruit spread upon trays and left upon the ground, dries every hour of the twenty-four. As, from the amount of our crop, much of our fruit must necessarily be dried, this advantage can hardly be overestimated.

With all the advantages that have been named, and none of them are overstated, it is no source of wonder that our horticultural interests are advancing with majestic strides. The present output will be doubled in five years, and new areas are continually being planted. As has been remarked, there is much of the State yet undeveloped. When this shall have been fully developed, and when intelligent observation shall have determined what varieties of fruit will best succeed under all the varying conditions of soil, climate, and exposure, it will happen, it must happen, that California will furnish fruit to the world.

It needs only that we secure ample means of distribution, that the excellence of our product be made known, together with the fact that it can be produced and furnished at a price that will bring it within the reach of all, and there is little fear but that consumption will keep pace with production, and that however large our product may be, it will eventually find a ready market. When the sanitary value of a partial fruit diet comes to be understood, and when people learn what in the end they will learn, that well-prepared fruit, even if it be dried fruit, is more palatable and far more healthful, especially for children, than a meat diet, and that it is besides far more economical, the market can hardly be oversupplied.

The advantages of California in the line of grape culture are even

more marked. With every adaptation of soil and exposure, there are probably no varieties that may not be made at home here. There is reason to believe that in the line of wine grapes, California can produce grapes, the wine from which will equal, if not excel, that of the most celebrated vineyards of France or Spain. Our climate allows the grape to hang uninjured on the vine until it is fully ripe, and this period may be extended to weeks after, if desirable. In fact, grapes are better preserved hanging on the vine than in any other way. This ripening, and even partial drying out after ripening, has a marked effect upon the qualities of the wine produced. The field of viticulture is exceedingly broad, and has, as yet, been but fairly entered.

The fact that raisins can be and are cured in the open air and among the vines, makes it possible for us to produce them at a moderate cost, and the quality has already spoken for itself. The raisin industry can be extended to an almost unlimited degree, as nearly all of the valley portions of the State, with the surrounding foothills, are well adapted to it. In this, as in viticulture, there is much yet to learn, but our growers are becoming apt pupils.

Table grapes grow to great perfection. The fact that they may be left upon the vines almost indefinitely gives an extended period in which to gather and market our crop. It rarely happens that the grape grower cannot gather luscious grapes from his vines to grace his Christmas dinner. More rapid means of transportation and improved methods of packing and handling the crop will widely extend the market of our table grapes.

CHAPTER V.

IRRIGATION.

The question of irrigation is one of the most important now confronting our people, and has a direct bearing upon the matter of horticulture. In many parts of the State, under the magic influence of water, the desert has been converted into a garden, and what was at one time considered the most valueless has proved the most valuable land. It may be affirmed that irrigation has made all of Southern California, for while there are large tracts upon which vegetation will flourish without artificial watering, these are small in comparison with the vast area which has been converted from an absolutely desert condition to one of wonderful fertility beneath its influence. All through the San Joaquin Valley great attention has been of late years given to irrigation, and the result is the gradual conversion of that vast wheat field into orchards and vineyards, the cutting up of tracts, thousands of acres in extent, into small holdings, and the building up of tens of thousands of homes, with flourishing cities and modern improvements, while before its introduction these were but scattered hamlets and uninhabited plains. It has made possible the settlement of vast areas of public lands, and changed the face of the whole valley. Of course, in various parts of the San Joaquin Valley naturally damp land is found, and cereals, which are a winter crop, grow without irrigation; but horticulture and irrigation in the San Joaquin Valley are companion industries, and the former could not exist without the latter. On the western slope of the Coast Range climatic conditions are very different to those of either Southern Cali-

fornia or the San Joaquin Valley, and irrigation is less of a necessity, although it is a great aid to the fruit grower in many localities.

In the Sacramento Valley irrigation is not so extensively resorted to as it is in the San Joaquin Valley, but in the counties on the western slope of the Sierra it is obtaining a strong foothold and increasing with the increase of the area in orchard. West of the Coast Range and north of San Francisco irrigation is not required, nor is it resorted to in the mountain counties, climatic conditions, as has been explained elsewhere, rendering irrigation unnecessary.

Irrigation was originally resorted to as a make-shift in those sections of the State where crops could not be grown without its aid, but it developed so many advantages over the uncertainties of the older system—that of depending upon the weather—that it took a deep hold on the people, and grew in popularity until it has spread over a large portion of the State, and is still increasing, even in such places as have ordinarily an abundant rainfall to insure crops. Land upon which crops will grow, especially in the summer months, is very limited in comparative area, and land to be made profitable for fruit requires irrigation. Herein, too, lies the great advantage enjoyed by the California farmer over his Eastern brothers. He has no fear of drought. There is no uncertainty about rainfall, for when his crops show signs of requiring moisture, he does not look at the clouds and depend upon nature, but has the life-giving current at his command, and supplies it to his crops as it is required. What at first was mere expediency, has resolved itself into a necessity, and no Californian who depends upon irrigation for his crops would exchange with the Eastern farmer, who has to rely upon the uncertainties of the weather for his.

Nothing will more conclusively prove the importance of this great subject than the growth of California during the past decade, and the fact that that growth has been wholly in the irrigated counties. During the past ten years California has gained at the rate of 39 per cent in population. The cause of that gain can be seen when it is known that thirteen counties of the State have lost in population from 1 to 73 per cent, while fifteen, including the most important irrigated areas, have grown more rapidly than the State at large. In the counties that have fallen back, mining, stock raising, and lumber industries have been the principal support. In the fifteen counties that have grown so largely farming pursuits under irrigation have become the chief feature of their development. The total population of the State in 1880 was 864,552. In 1890 it was 1,203,969. The gain in the eleven counties most deeply interested in irrigation has been over 753 per cent. The percentage is as follows:

	Per cent
Fresno.....	228
Kern.....	79
Los Angeles.....	234
Merced.....	36
Orange.....	244
San Bernardino.....	227
San Diego.....	295
San Luis Obispo.....	77
Santa Barbara.....	66
Tulare.....	120
Ventura.....	98

The principal irrigation centers of the State are the counties of Los Angeles, San Diego, San Bernardino, Kern, Tulare, Fresno, and Merced. In the twenty years from 1870 to 1890 the population of these counties

will be seen to have increased at a far greater rate than that of any other of the interior counties. These figures are well worth studying:

	1870.	1890.
Los Angeles.....	15,309	101,410
San Diego.....	4,951	34,878
San Bernardino.....	3,988	25,486
Kern.....	2,925	10,031
Tulare.....	4,533	24,875
Fresno.....	6,336	31,877
Merced.....	2,807	8,162

The seven leading irrigation counties showed the following remarkable increase in wealth for the twenty years covered:

	1870.	1890.
Los Angeles.....	\$6,918,074	\$67,121,610
San Diego.....	2,539,957	27,703,520
San Bernardino.....	1,202,482	22,490,440
Kern.....	1,974,856	10,389,154
Tulare.....	3,456,766	21,742,827
Fresno.....	3,219,230	35,539,655
Merced.....	3,202,455	13,368,921

It is safe to say that nine tenths of this remarkable increase in wealth is due to the irrigation enterprises that have been carried out in the counties referred to.

The importance of irrigation, not in our State alone, but in the whole of what is known as the "arid region," is shown by the attention which is being paid to it and the vast areas of new land being put under ditch each year. In 1886 the reclaimed area was reported at 5,500,000 acres. In 1890 this had increased to 15,112,106; in 1891 it had swelled to 18,533,107, and with the completion of the works now under construction this will be increased to 25,000,000 acres which can be irrigated and made of use to the horticulturist.

The following table is a condensation of the results secured by statistical inquiry as to the irrigated area of the arid States:

States and Territories.	Estimated under Ditch.	Acreage under Cultivation, 1891.	Number Artesian Wells, 1891.
Arizona.....	660,000	315,000	42
California.....	4,500,000	3,550,000	3,500
Colorado.....	3,007,050	1,800,000	4,500
Idaho.....	1,200,000	330,000	12
Kansas (west of 97° long.).....	990,900	120,000	50
Montana.....	1,250,000	419,000	36
Nebraska.....	200,000	40,000	100
Nevada.....	150,900	75,000	76
New Mexico.....	700,000	405,000	10
North Dakota.....	2,500	2,000	670
Oregon.....	125,000	45,000	6
South Dakota.....	100,000	54,000	950
Texas.....	350,000	160,000	1,000
Utah.....	735,000	423,000	2,524
Washington.....	175,000	75,000	10
Wyoming.....	3,031,484	185,000	6
Totals.....	17,177,834	7,998,000	13,492

As indicating the change which irrigation works in a country, the "Kern County Gazette" draws a comparison between Kern County before and after the introduction of irrigation, which would apply equally to every county of the San Joaquin and Southern California. It says:

"Twenty years ago Kern County was an almost unknown factor in California. Bakersfield was a little hamlet where supplies were obtained by the sheep and cattle herders and miners, who were sparsely scattered through the valley and in the mountains. There were no railroads within hundreds of miles, and the agricultural possibilities of the soil were not even suspected. Vast areas that are now highly productive were regarded as utterly worthless. To be sure, there were large streams running down the mountain into the valley, but their waters rolled on unheeded, while the vast plains on either hand were classed as desert land.

"But there came enterprising and far-seeing men, who saw the possibilities that inured in the union of the land and the water. Backed up with immense capital, they set systematically at work in the development of a system of irrigation canals that has been declared, on the highest and most unprejudiced authority, to be the finest in the State.

"As the first result of the diversion of the water upon the arid plains, Kern County now boasts of the largest alfalfa fields in the State, covering tens of thousands of acres, and is supporting myriads of sheep, cattle, and horses of the best grades. No county in the State ships so many fat sheep and cattle and fine horses to the San Francisco market as this. Potatoes, corn, and other farm products are also produced in large quantities and of the finest quality.

"Of late, however, horticulture has received a large impetus, and thousands of acres of vines and trees have been planted. The soil and climate are particularly adapted to the raisin grape, and a large area has been planted to Muscat vines. Other fruits have also been largely planted, the peach particularly receiving much attention, and returning handsome profits."

The passage of the Wright Irrigation Act, on March 7, 1887, providing for the formation of irrigation districts, and the bonding of real estate therein for the purpose of acquiring water rights and building waterworks, gave a great impetus to this work, and a number of districts have been organized under it, of which the following table gives a list of thirty-three, with their location, names, and Post Office addresses of their Secretaries; acreage, amount of bonds voted, and the cost of supplying water per acre:

District.	Secretary and P. O. Address.	No. of Acres.	Bonds Voted.	Bonds per Acre.
San Bernardino—				
Allessandro	G. H. Kelsey, Moreno.....	25,000	\$765,000	\$30 00
Citrus Belt	D. A. Barras, Colton	12,160	800,000	65 78
East Riverside	J. A. Vanarsdale, Colton	3,000	250,000	83 33
Grapeland	E. T. Meyers, Grapeland	10,787	200,000	18 54
Rialto	D. Robinson, Colton	7,200	500,000	69 44
San Diego—				
Elsinore	W. H. Townsend, Elsinore..	11,300	none.	—
Escondido	A. J. Werden, Escondido	12,814	450,000	35 12
Fallbrook	G. A. Scott, Fallbrook	12,000	—	—
Murietta	J. C. Mason, Murietta	15,600	none.	—
Perris	H. A. Plimpton, Perris	22,680	442,000	25 00
Spring Valley	—	22,000	none.	—
Pleasant Valley	W. P. Milliken, San Jacinto..	20,000	—	—
Los Angeles—				
Big Rock Creek	Ira Carter, Llano	30,000	400,000	13 10
Monrovia	—	4,500	200,000	44 44
Orange Belt	F. P. Firey, Pomona	50,000	175,000	3 50
Palmdale	C. W. Doderhoff, Palmdale ..	4,500	50,000	11 11
Vineland	I. N. Rhodes, Vineland	—	—	—
Dehesia	—	—	—	—
Orange—				
Anaheim	B. V. Garwood, Anaheim	32,500	600,000	18 46
Colusa—				
Orland, South Side	L. P. Behrens, Orland	25,000	100,000	4 00
Central	R. De Lappe, Maxwell	156,550	750,000	4 78
Kraft	J. W. Rodgers, Orland	13,500	80,000	5 93
Colusa	—	100,000	600,000	6 00
Tulare—				
Tulare	E. Oakford, Tulare	34,149	500,000	14 64
Kern—				
Poso	J. E. Anderson, Spottiswood ..	40,000	500,000	12 50
Kern and Tulare	—	80,000	700,000	10 56
Kern and Tulare	J. O. Sidener, Delano	—	—	—
Fresno—				
Madera	E. H. Cox, Madera	305,000	850,000	2 78
Fresno and Tulare—				
Alta	G. H. Weaver, Dinuba	129,927	675,000	5 19
Sunset	M. McWhorter, Selma	363,400	—	—
Selma	W. L. Chappell, Selma	271,000	none.	—
Stanislaus—				
Modesto	C. S. Abbott, Modesto	81,500	800,000	9 81
Stanislaus and Merced—				
Turlock	R. M. Williams, Ceres	176,210	600,000	3 40
Yuba—				
Browns Valley	J. McFarlane, Browns Valley ..	43,000	110,000	2 56
Totals	—	2,106,775	\$11,197,000	\$8 04

This law has been in operation now for a sufficient time to prove its benefit, and under its operation a great deal of the arid land of California has been and is being made productive, especially for horticultural purposes. As the irrigation facilities of each of the counties are mentioned under their respective heads, it is needless to more than briefly allude to the matter in this place; suffice it to say, that successful horticulture in our State depends largely upon irrigation.

CHAPTER VI.

ADAPTATION OF FRUITS AND PLANTS.

In a State that is comparatively new, and in an industry that is newer, the determination of what varieties will best succeed in different localities becomes a matter of paramount importance. A considerable part of California is yet an unexplored region horticulturally. So many factors enter into the equation determining the question of adaptation that a careful observer will be slow to assume, and slower yet to assert, that his judgment is infallible. It is so easy to overestimate some of these factors, and to omit others, and it is but prudent to exercise great caution in planting in any untested locality. It requires the observations not only of one year, but of a series of years, before one can feel reasonably confident that he is right in his conclusions. Many of these points can be safely decided only by the final crucial test, experiment. From a lack of this caution many lamentable failures have been recorded. It was assumed for many years that citrus fruits would thrive only in valley lands, but experiment has shown that the mesa and foothill lands produce as large a crop, and of better quality.

For years it was thought that apricots, nectarines, peaches, and even grapes, would mature to perfection only with a southern and western exposure. Again experiment shows that a northern exposure gives a longer lived tree and equally well matured fruit.

In localities where facts have been clearly demonstrated there is little danger of going astray. And yet, locality is sometimes not a well-understood term. There are many places where a difference of half a mile in distance and five hundred feet in elevation change the whole matter of adaptability.

APPLE.

(Pyrus malus.)

The apple is the world-renowned fruit of temperate climates, and is most universally used. In California nearly all the varieties known in Europe are grown and flourish exceedingly well, and also those of Asia. The standard and favorite varieties, however, are mostly of American origin.

Upon our upper foothill and mountain land the apple produces abundantly, and of excellent quality. The apple grows in the warmer valleys, but although of good size and fair to look upon, it is too often faulty in both texture and flavor. This deduction in reference to the growth of the apple is very general, but has been pretty clearly demonstrated by experiment: A northern or an eastern exposure is better than one to the south and west.

There is a vast area of territory in California upon which the apple does phenomenally well. In many of the coast counties, where the temperature is not too high, in some of the foothill regions of the Sierra and Coast Range, and in the higher mountain counties, apples are the standard fruit crop, and the fruit produced there cannot be surpassed in size and quality. To those who have good apple lands adjacent to means of transportation to the centers of demand, apples have proved remarkably profitable. In many of our coast and mountain counties, and in the higher altitudes of the interior valleys, apple growing is rapidly assuming its proper place as a profitable industry.

PEAR.

(Pyrus communis.)

The pear tree is a native of Europe and western Asia. It was introduced into California over a century ago by the Franciscans, but the trees they planted were seedlings and of inferior kinds, yet they ranked as favorite among the people then. One, a yellow pear, ripened about June 24th, and that being St. John's day, it was named "Pera de San Juan" (pear of St. John). This pear is still cultivated. Another was known as the Hog pear, "Pera de coche," and a long, dark, pyriform pear as "Bergamota." When the first pear trees of foreign origin were introduced into California it is difficult to say, but it occurred somewhere about the year 1846. From that time on the pear has proved itself one of the most hardy and most profitable fruits of California.

The pear seems to adapt itself to diversity of soil, climate, and exposure more readily and more fully than does the apple. It therefore grows to perfection over a much wider range of the State. In the hot valleys, upon the hillsides, in the cooler parts, and under greatly differing conditions of soil, it thrives almost equally as well. All the European and Asiatic varieties succeed here, and almost every variety has been introduced. The pear area is being rapidly enlarged.

PEACH.

(Persica vulgaris.)

The peach, as its name indicates, is a native of Persia. It was introduced into California more than a century ago, but the kinds then known were very inferior. Foreign sorts were planted as early as 1846, and soon after this, by the selection and propagation of desirable seedlings, improvement began. The result is that we have here many choice varieties, some of the finest peaches in the world being of California origin.

This fruit thrives best in the lighter soils of our warm valleys and lower foothills. In localities suitable for its growth it gives something of a crop the second year after being set in the orchard, and usually continuous good crops thereafter.

The entire valley portions of the State produce good peaches, although in some of them irrigation is necessary to secure the best results.

NECTARINE.

(Persica vulgaris.)

The nectarine, undoubtedly a "sport" of the peach that has become constant, produces abundantly in the same localities that are adapted to peach culture, and under like conditions. The culture of the nectarine is in all respects the same as that of the peach, and its habits are also similar. The nectarine is a favorite fruit green and dried, and always finds a ready market.

APRICOT.

(Armeniaca vulgaris.)

In no other State in the Union does the apricot flourish so well, or yield such early and large returns, as it does in California. The culture of this favorite fruit in this country is entirely limited to the Pacific Coast, and to California in particular. The apricot is a native

of Armenia, Arabia, and the higher regions of central Asia, and the varieties introduced from those countries have become acclimated and thrive abundantly well. Some of the choicest varieties, however, are selected seedlings, originating here. For canning and evaporating purposes, as well as for use in the fresh state, this fruit can hardly be excelled, and in sections adapted to its culture it is a source of great profit.

In the cultivation of most fruits, California is forced to compete with other portions of the United States, but for all practical purposes apricot growers have the entire world for a market. All the conditions necessary to the peach and nectarine are necessary to the apricot, and some others. In the warmer valleys, between the foothills and upon the protected sides of these hills, good crops are generally realized.

PLUM.

(*Prunus domestica*.)

The plum is a native of Asia and the southern part of Europe. Many varieties have been imported, nearly all of which do exceptionally well in certain localities. Plums do not come "true to seed," but a comparatively large number of the seedlings produce desirable fruit. From this cause there is a very great number of named plums, many of the most popular and favorite varieties having originated in America, excepting, however, those of the variety classed as "prunes." The boundary line between the prune and its parent, the plum, is not very clearly drawn; but those varieties that possess exceptional curing qualities, being rich in saccharine and having a firm texture, so that they can be dried in the sun or artificially without fermenting at the pit, are, by common consent, classed as prunes.

The commercial value of California's prune product is simply immense; and when it is taken into consideration that the prune was not introduced until 1856, and that for twenty years but little progress was made, it gives some idea of what to expect in the future.

CHERRY.

(*Cerasus*.)

The cherry is a native of Asia, but the choicest varieties grown in California are mostly of American origin, several of the best having originated in our own State.

In the different portions of the State which are adapted to the fruit, the cherry makes a fine growth and bears abundant crops. California cherries, like all other fruit products of the State, are remarkable for their size, flavor, and beauty of appearance. Their size dwarfs that of their Eastern competitors, and even the imported varieties. Where grown under favorable conditions of soil and climate the fruit is so much superior to that grown in the East as to cause experts to doubt whether they are the same variety.

The cherry crop of California aggregates a very large amount, and has always been found a remunerative crop under favorable conditions.

We have here growing the largest cherry tree in the United States. It was planted in 1853, and is 10 feet in circumference and over 80 feet in height. Its yield in 1891 was 3,000 pounds.

OLIVE.

(*Olea europea*.)

The olive is a native of the temperate seacoast regions of Asia and Africa and the south of Europe. The olive trees known in this State as the "Mission olive," are supposed to have been introduced by the Franciscans on an expedition to establish the Missions in this State in 1769. From seeds that were then planted at the Mission San Diego, the tree spread until it could be found among all the Missions established, and from these orchards were started, the importance of which was hardly conceived at that time. From the early plantings olive oil was made, which was not slow in coming into favor, and as its value as a food and a medicine became known that industry spread, and to-day it ranks among the leading industries of the State. Many new varieties have been introduced of late, and all thrive equally well, and in time their merits will be known, both for oil and for pickling.

Almost the entire State seems to be well adapted to the olive—the higher parts of the Sierra range and the low lands nearest the ocean, alone excepted. Olives grow with little moisture, and are, therefore, also suited to the drier portions of the State. They also seem to thrive well in light soil, and some of the best trees are found growing upon rocky points where probably no other trees would live.

The industry is, as yet, not very extensively developed, but bearing areas can be found from San Diego to Shasta County, and as all of them bid fair to become paying investments, there is every prospect that it will soon become a very important industry.

FIG.

(*Ficus carica*.)

The fig is one of the oldest of cultivated fruits on record. It is a native of the eastern Mediterranean region. The fig grows everywhere, except in the low, wet lands near the coast. It, however, grows luxuriantly in the hotter parts of the State. It will stand here a range of temperature from 18° to 120° F., and, except in places where the lower temperatures are reached, bears a continuous crop. In the drier situations it needs some irrigation, but upon the Coast Range it thrives well without it. The introduction of the finer varieties, and improved methods of handling the product, are making it quite apparent that the culture of the fig will yield a good profit.

GRAPE.

(*Vitis*.)

The grape is thought to have been a native of Persia, although its early history is somewhat in doubt. In California nearly every foreign variety is grown, either for a market product or as an experiment. Where care is used in the selection of soil and exposure, grapes of fine varieties grow and produce well over a wider range even than olives. The soil should be loose, sandy or gravelly, with good drainage. In some localities on the sand-rock ridges productive vineyards are found, where a casual observer would be inclined to assert that nothing would grow. Grapes, where market value depends largely upon the "coloring up" well, need a southern exposure, and color better close to the ground. The best table grapes are grown upon side hills so steep as hardly to

admit of anything but hand culture, where the rays of the sun are thrown back upon them from the heated slopes.

The Eastern varieties are being grown to some extent, but many of these, to get a fair crop, have to be trellised, and that requires considerable labor. Every year new foreign varieties are being introduced, and California can show almost an infinite variety of good grapes. California raisins are known the world over, and this industry, although it is only the outgrowth of the past twenty years, ranks to-day among the most important of our State. The rapid increase in the output of raisins in this State has had the effect of very materially replacing the imported article, and we may confidently expect that in a short time the United States, instead of being an importer of raisins, will become an exporter, the product being extensively grown in California.

ORANGE.

(*Citrus aurantium*.)

The orange belongs originally to China and India, but when it was introduced into the State and how it came about, is difficult to say. The orange is at present one of the most important, if not the most important, fruit raised in California. Most of the trees grown originally were seedlings (trees grown from seed), and planted to orchard as such. In recent years many foreign varieties were introduced that became acclimatized, and others that were originated here have to a large extent taken the place of the seedling then grown. The quality of our oranges cannot be surpassed, and as evidence of this fact I need only cite the awarding of gold medals to California at the New Orleans World's Fair for the best twenty varieties against the world.

The orange is a tree of great longevity; there are numerous trees throughout the State more than a century old.

Of other members of the family we have the Pomelo (called "Grape Fruit," because of the fruits growing close to each other and appearing like great clusters of grapes), the Shaddock, the Kumquat, the Bergamot, the Tangierene, the Mandarin, and others. All thrive well and bear abundantly. But some of these, as the Shaddock and Pomelo, are only grown to a limited extent and more for ornament.

LEMON.

(*Citrus medica limonum*.)

Interest in the culture of the lemon has of late shown a marked activity, and vast areas of land are annually being set out to lemons. There are many portions of the State especially adapted to the culture of the lemon, which has been found a very profitable fruit to grow. The difficulty heretofore experienced in handling and shipping the lemon has been overcome, through the discovery of the proper method of curing, packing, etc. The lemon is an ever-bearing tree, and shows flowers and fruit in different stages of growth throughout the year.

CITRON.

(*Citrus medica cedra*.)

The citron is one of the many fruits that were introduced by the Franciscans. It grows and fruits well wherever the orange grows. Its cultivation is very simple. Choicer varieties are now being introduced,

and there can be no question but that in time the California preserved citron will supplant the foreign product in our markets.

LIME.

(*Citrus medica limetta*.)

The lime is the least cultivated of all the citrus fruits of California. It grows and bears well, but requires sheltered nooks, exempt from frost, to bear regular crops, although the tree succeeds in soils unsuitable for the growth of the orange. There is no reason why the lime could not be more largely grown, and why the manufacture of prepared lime juice and citric acid might not be carried on on a most extensive scale. Lime juice and citric acid are both necessities all over the civilized world.

POMEGRANATE.

(*Punica granatum*.)

The pomegranate is a native of western Asia, but was long cultivated in southern Europe, from whence it was no doubt introduced here by the Franciscans, and grows and fruits almost everywhere. The tree is a beautiful ornamental shrub, bearing a beautiful fruit. The pomegranate is a tree which partakes of the antiquity of the fig, the vine, and the olive, and which, in point of utility, is numbered with the grain-bearing plants, and is used in medicine, and therefore should possess no little interest.

QUINCE.

(*Cydonia vulgaris*.)

The quince is a native of western Asia and southern Europe, and was, no doubt, introduced into the State by the Franciscans, as it is spoken of among the records of the founding of the Missions. It is probably one of the most ancient of fruits, and has always been a popular fruit for home preserving and jelly making. The quince produces abundantly in any part of the State where apples or pears will grow, and the fruit reaches an enormous size.

PISTACHIO.

(*Pistacia vera*.)

The pistachio nut tree grows and bears well in California, and there can be no doubt but that it will be remunerative, especially after the introduction of choice kinds.

TAMARIND.

(*Tamarindus indica*.)

This handsome tree is a native of India, and seems well adapted to several portions of our State. The flowers are small, of a pinkish-white color, followed by pods inclosing a pleasant acid pulp, much used, when preserved in syrup or sugar, as a basis of a cooling drink, and also in medicine, being rich in formic and butyric acids.

CAROB.

(*Ceratonia siliqua*.)

The tree is a very handsome evergreen, with thick, shining, pinnately-compound leaves. The trees are quite widely distributed over the State, and some have borne fruit. The carob pods contain a large

quantity of agreeably flavored mucilaginous and saccharine matter, and are used in southern Europe for feeding horses, pigs, etc., and occasionally, in time of scarcity, for human food.

PERSIMMON.

(*Diospyros kaki.*)

This persimmon is a native of Japan, and does exceedingly well in California. The tree is quite hardy, and fruits freely in most every section. The colors of the different varieties range from bright orange-red to light vermilion; the external appearance of some varieties is much like the tomato. The flesh when ripe is soft, and the flavor delicious. The merits of this fruit are well known, and it is fast gaining favor.

PINEAPPLE.

(*Ananassa sativa.*)

The pineapple, although a tropical fruit, grows and bears well in certain localities, but of course its culture is confined to those localities exempt from severe frosts.

WHITE SAPOTA.

(*Casimiroa edulis.*)

This tree is a native of Mexico, and trees are growing in this State nearly one hundred years old. The fruit is of roundish form, about an inch in diameter, with a juicy pulp of a pleasant sub-acid flavor.

BANANA.

(*Musa.*)

The banana is not extensively grown in the State, although it does remarkably well under favorable conditions. The plant is of easy culture, and is more cultivated for its beauty as an ornamental plant.

GUAVA.

(*Psidium.*)

The guava grows and fruits exceedingly well in California, and the jellies made from this fruit are fast coming into favor. Guava jelly is generally acknowledged to surpass all others in richness and flavor, and as it becomes better known there can be no doubt but that it will become established among the food delicacies. The fruit is also eaten fresh, and is preserved and canned.

LOQUAT.

(*Eriobotrya japonica.*)

The loquat is a native of Japan, and thrives exceedingly well in many portions of California. It is a beautiful evergreen, growing to the height of twenty to thirty feet. The fruit ripens from the 1st of February to the 1st of May, and is pale yellow, like a plum, and contains from one to three large pits. It has a peculiarly pleasant acid taste, and is much admired for table use when fresh from the tree, and for converting into jelly. It is the first fruit of the season.

DATE.

(*Phoenix dactylifera.*)

The date palm was introduced into California by the Franciscans, and many date trees are to be seen in various parts of the State over a century old. The date tree grows very luxuriantly, and seems to adapt itself to surrounding conditions, which is shown by its successful growth and fruiting capacity, bearing fine dates every year. New varieties are being introduced, and in future dates will probably become in California an article of no little importance. The date palm is a showy tree, combining as it does the beautiful and the useful in a very high degree.

JUJUBE.

(*Zizyphus jujuba.*)

The jujube is a native of India and China, and is a beautiful shrub, or tree, bearing a red or yellow fruit the size of a cherry, from which is made the delicate paste of the confectioner. The tree grows well, and fruits abundantly every year.

WALNUT.

(*Juglans.*)

The walnut is a native of Persia, and was no doubt introduced by the Franciscans, as many large trees, probably a century old, are yet to be seen at the various Missions throughout the State. The walnut is extensively grown in the State, and is a tree yielding large returns. The first trees planted were from imported seed, and has been designated as the "English" walnut. The southern part of the State seems especially adapted to the growth of this variety of walnut, and the largest and oldest orchards are to be found there, from which large returns have been realized. Of late many new varieties have been introduced, which possess a thinner shell, and seem best adapted for the northern portions of California, and the southern portion as well.

The area of walnut culture is spreading rapidly over portions of the State where it finds a congenial home. From the results already attained this industry is growing in favor.

PECAN.

(*Carya oliviformis.*)

The pecan nut does remarkably well in the State, although it has not been cultivated extensively. This tree requires a deep, rich soil and a warm exposure to secure its best development.

PEANUT.

(*Arachis hypogaea.*)

The peanut is extensively grown in California, and the product is becoming very popular. Extensive plantations have been made in different portions of the State, where the soil is rich sandy loam, and from which have been derived handsome returns.

CHESTNUT.

(Castania vesca.)

Native of Asia Minor; does remarkably well throughout the State, and grows and fruits wherever the walnut is grown. The sorts most largely planted are the Italian and Japanese. These nuts reach a remarkable size, and are of fine quality.

HAZELNUTS—FILBERTS.

(Corylus.)

Hazelnuts and filberts have not given very satisfactory returns, yet they thrive and do well in most any part of the State. Grafts inserted into the wild hazelnut have produced better results, and might not the experiment be pursued further? The wild hazelnut is indigenous to the northern portion of the State, and can be found from the valley lands to the mountain tops. It is very productive and hardy, rarely, if ever, failing to produce a good crop annually.

ALMOND.

(Amygdalus communis.)

The almond tree is a native of Africa and Asia, and thrives wonderfully well in California. The almond has been sufficiently remunerative to induce its planting largely, and the area is rapidly increasing. The tree does well on land suitable for the peach; it is a good bearer, and gives good returns. The Languedoc, a French variety, was formerly grown, but proved itself to be a shy bearer and unprofitable. Extensive experiments were carried on for several years, until new varieties were originated in California that are reliable and which yield certain crops, are very prolific, and the fruit of which has no equal.

RASPBERRY.

(Rubus.)

The raspberry is a low, deciduous shrub, and bears abundantly throughout the State. The large-fruited varieties were introduced from most European countries, including Great Britain. Besides these, we have in the woods throughout the State the common black raspberry, or thimbleberry, and the red raspberry, which bear very good fruit.

The raspberry is a deciduous shrub with a creeping, perennial root-stock, and a biennial stem. The fruit is extensively employed for cooking and preserving in various ways; it is also used for dessert, and largely used in the manufacture of raspberry brandy, wine, vinegar, etc.

BLACKBERRY.

(Rubus fruticosus.)

The blackberry is a hardy deciduous shrub, and succeeds in all parts of the State. It is a favorite fruit in the markets, and, like the raspberry, is used for cooking and preserving in various ways, and for dessert and the manufacture of blackberry brandy, etc.

CURRANT.

(Ribes.)

The currant is a native of Great Britain and the north of Europe, and is an exceedingly hardy fruit-bearing shrub. It does remarkably well in California near the coast, and seems to require cool and moist air to bring its fruit to perfection. Currants are also grown quite largely along the rivers and in moist soils along the foothills. There are several varieties grown. The currant is largely used for dessert, tarts, and for jelly and jam.

GOOSEBERRY.

(Ribes grossularia.)

The gooseberry is a hardy deciduous shrub, a native of various parts of Europe, including Great Britain. It thrives well in this State along the coast counties and along the rivers and foothills. It seems to require a cool climate to do well. The fruit is very popular, and is valuable in a green or ripe state for cooking, bottling, or preserving.

STRAWBERRY.

(Fragaria.)

The strawberry is a native of the temperate latitudes of both hemispheres, of Europe, Asia, North and South America. This berry is the most delicious and the most wholesome of all berries, and the most extensively cultivated; in fact, it is doubtful if there can be an orchard anywhere in the State that has not a patch of strawberries from which the home table is supplied. The fruit is universally favored, and is always held in high esteem. The fruits are used, as it is well known, when ripe, in various ways, principally for dessert, but also for cooking and preserving.

MULBERRY.

(Morus.)

The mulberry is a hardy deciduous tree, and thrives well throughout the State. The first mulberry trees introduced were for the purpose of feeding silkworms. In recent years most of the European and Asiatic fruiting sorts have been introduced, and all do remarkably well. The berries of most of these sorts attain a remarkable size, and are of excellent flavor.

CRANBERRY.

(Oxycoccus macrocarpus.)

The cranberry is a trailing shrub—a native of Europe, North Asia, and North America. It is a plant that grows on swampy land. So far only limited experiments have been tried in its culture along the rivers, on bottom lands which the water covers for a few inches. The experiments have so far not proved commercially successful, but the fruit produced in the State has been pronounced good. More extended experiments will have to be made before we can arrive at any definite conclusions.

CHERIMOYER, OR CUSTARD APPLE.

(Anona cherimolia.)

The cherimoyer is a native of Peru, and does remarkably well in this State, especially in the southern part, but requires sheltered situations. It is a handsome tree, and the fruit is quite odd, but sweet and pleasant to the taste.

ALLIGATOR PEAR.

(Persea gratissima.)

This tree is a native of Mexico, and does exceedingly well in this State. The tree seems to be suited to the different conditions, but gives better results in sheltered localities.

GRANADILLA.

(Passiflora edulis.)

The granadilla is a species of passion vine, bearing edible fruits, and is very ornamental.

MEDLAR.

(Eriobotrya germanica.)

The medlar grows and does well in most all parts of the State, but the tree is planted more for ornament than for its fruit.

MELON SHRUB.

(Solanum muricatum, syn. guatemalense.)

A small shrub, a native of Guatemala, bearing a yellow fruit, splashed with violet, with a strong melon taste. The plant is very easily propagated, and does well where there are no harsh frosts.

CHAYOTA, OR CHOEHO.

(Sechium edule.)

This plant, whose native country is unknown, was introduced from the south of Europe and Africa. The plant bears an edible fruit, which is considered wholesome, and thrives well in different portions of the State. The root grows to an enormous size, somewhat resembling a yam, and is valuable as food for stock. The fruit resembles the vegetable marrow.

TOMATO.

(Lycopersicon esculentum.)

Native of South America. The tomato is extensively grown throughout the State. The plant thrives almost everywhere, but requires a rich soil to give best returns. California canned tomatoes are now known the world over, and the industry is one of no little importance. The pack now aggregates over 300,000 cases yearly.

CAPE GOOSEBERRY.

(Physalis edulis.)

This plant is a native of Peru. It grows and fruits most everywhere where the tomato thrives. The fruit is used in cookery, and for preserves.

BAMBOO CANE.

(Bambusa.)

Bamboo is native of Asia. It grows very well in most parts of the State, in moist soils, or where irrigation is practiced. The plant is very ornamental, and the cane is valuable for hedges and other purposes. The plant grows to a great height.

TUNA.

(Opuntia.)

This plant was used in the early days for hedges, and many are yet to be seen around the Missions. The fruit has a delicious flavor. It is used by some people for jellies, to which purpose it is well adapted. In the early times it met with great favor.

SPANISH BAYONET.

(Yucca.)

There are three species of this plant indigenous to California. It is grown on the plains—in the deserts extending into Arizona. This plant has a commercial value in its fiber, from which cordage and paper are made.

PAMPAS GRASS.

(Gynerium argenteum.)

This highly ornamental grass is a native of South America. Careful selection of seedlings and cultivation has produced varieties that are remarkable for their size and rich cream tint of the plumes, altogether different from the original stock. A very large acreage is planted in this State, and the plumes are shipped largely to the Eastern States and Europe.

NEW ZEALAND FLAX.

(Phormium tenax.)

Native of New Zealand. This plant thrives luxuriantly in all parts of the State. The leaves are sword-shaped, and from the fiber of which strong cordage can be manufactured.

COTTON.

(Gossypium.)

This fiber plant grows and does remarkably well in California, especially where irrigation is practiced. Extensive plantations have been made in different localities, and the quality of the fiber has been pronounced superior to that of the Southern States.

FLAX.

(Linum usitatissimum.)

This fiber plant is cultivated extensively throughout the State for seed, and does remarkably well, yielding good returns as a paying crop.

HEMP.

(Cannabis sativa.)

Hemp is a native of North India and Persia. It is an annual plant, growing to a height of six to eight feet, but in rich soils attains a much

greater height. Experiments have been made in the culture of this plant in many portions of the State, and it does quite well, but more experiments are required to test its commercial value.

JUTE.

(*Corchorus capsulari.*)

This fiber plant is a native of Asia and India. Experiments have been made in the cultivation of this plant in many portions of the State. It grows well, but so far has not attained the height it does in Calcutta. It does best on marshy lands.

RAMIE.

(*Boehmeria nivea.*)

Extensive experiments have been made in the culture of this important plant, and has proved itself well adapted to this State. It is a native of the East Indian Archipelago. From ramie a fiber is extracted which, upon proper management, can be put to almost unlimited uses for manufacturing purposes.

HOP PLANT.

(*Hemulus lupulus.*)

This dioecious perennial plant is indigenous in temperate Europe and North America. It thrives wonderfully well in this State, and is especially adapted for the low or moist lands. The culture of the hop is carried on very extensively, and from which handsome returns are netted to the growers.

ALFALFA.

(*Medicago sativa.*)

A native of the Mediterranean region. This plant is undoubtedly the most valuable forage plant in the world. It is the best of all forage plants for a drought, its roots penetrating the soil to a great depth. It has proved a priceless boon upon the naturally moist or irrigated lands of the State.

GINGER.

(*Zingiber officinale.*)

The root of this plant consists of a jointed root, or rhizome, which throws up numerous reed-like stems about two feet and a half in height, with long, narrow, lanceolate leaves. The plant grows and does very well in most parts of the State.

MUSTARD.

(*Sinapis nigra.*)

Mustard is extensively grown in California. Numerous species are cultivated, and especially this variety, which yields the most pungent mustard, and is therefore mostly used by the manufacturers of that condiment.

CASTOR-OIL PLANT.

(*Recinus communis.*)

This plant has been grown in different parts of California for many years. It is a tender plant, easily destroyed by frosts. It makes strong growth, and produces seed the same year, from which castor oil is made.

TOBACCO.

(*Nicotiana tabacum.*)

The tobacco plant has been extensively grown in this State, and thrives well almost everywhere. Extensive plantings have been made, from which have been derived good paying returns.

PYRETHRUM.

(*Pyrethrum cinerazefolium.*)

This plant, a native of Dalmatia, is extensively grown in California. The product made from it is used as an insecticide, and is especially used against household pests, for which purpose it has no equal. It is found in the market under different brands. The plant thrives and does well in most portions of the State.

OPIUM POPPY.

(*Papaver somniferum.*)

Native of Asia. This plant thrives wonderfully well in most parts of the State, but as yet has only been grown for ornament. It is from this plant that opium, a drug, is manufactured.

BLACK WATTLE.

(*Acacia decurrens.*)

This valuable tree is a native of Australia, and thrives wonderfully well in California. The tree is of very rapid growth, and has a commercial value in its bark, which is used for tanning purposes.

CORK OAK.

(*Quercus suber.*)

The cork tree (or cork oak) is a native of the south of Europe, and has been grown in this State for several years. It thrives and does remarkably well. There have been exhibited at different fairs sections of bark from which cork is manufactured, of two to four inches thick, and the cork has been pronounced of superior quality.

SUGAR CANE.

(*Saccharum officinarum.*)

This is the sugar cane of commerce, and is a native of the East Indies. The plant thrives exceedingly well in most portions of the State, especially along the rivers and in irrigated sections. The quality of the cane has been pronounced excellent, and especially the higher percentage of saccharine which it has developed.

SUGAR BEET.

(*Beta.*)

The culture of the sugar beet is no longer an experiment; large plantations are to be seen in Santa Cruz, Alameda, and San Bernardino Counties. Sugar from sugar beets is now manufactured in the State extensively, and the industry has become of great importance. Three large establishments have been built to process the beets that are grown;

in fact, California is to-day the largest producer of beet sugar of any State in the Union.

MISCELLANEOUS PLANTS.

The following commercial plants have been planted in different parts of the State, as an experiment and for ornament. While some of them are not profitable to grow, yet it proves their adaptability to our soil and climate:

FENNEL (*fœniculum vulgare*).—Native of the warm-temperate parts of Europe and Asia. It is a perennial plant, with pinnate leaves.

CAMPHOR (*camphora officinalis*).—Native of China and Japan; makes fine growth.

BROOM CORN (*sorghum dura*).—Native of India; does well and is largely grown.

INDIAN MILLET (*sorghum vulgaris*).—Native of the West Indies; does remarkably well and is largely grown.

SUNFLOWER (*helianthus annuus*).—Native of Mexico; thrives exceedingly well and is largely grown. The seed is used to feed poultry, and can be used for the manufacture of oil.

RAPE, OR COLZA (*brassica napus-campestris*).—Native of India; quite hardy.

FENUGREEK (*trigonella fœnumgræcum*).—Native of India.

LICORICE (*glycyrrhiza glabra*).—Native of south of Europe, Hungary, and China. This plant thrives well in different portions of the State. It is a herbaceous perennial plant, with long roots, pinnate leaves, and small bluish flowers. Licorice roots have been exhibited at different fairs, and have been pronounced of superior quality.

NUTMEG (*myristica fragrans*).—Native of Sumatra and Madagascar.

COFFEE (*coffea arabica*).—The coffee plant is a native of the Abyssinian Mountains, from whence it was introduced into Arabia, Java, and the West Indies. The plant grows and thrives very well in a few frostless portions of this State, in sheltered situations. Experiments in its propagation are now being made on a larger scale, especially in the southern portion of the State, which has been pronounced by experts as possessing the requisite conditions and climate suitable for its culture.

TEA (*thea sinensis*).—The tea plant is a native of China, and is a shrub growing to a height of five to six feet, with leaves about three inches in length. Tea is a very hardy plant, capable of enduring great differences of temperature. It has been planted in California only as an experiment and for ornament. The plant does well in most parts of the State, and will grow on most any soil. The plant is very ornamental.

RICE (*oryza sativa*).—This important grain is a native of eastern Asia, and was cultivated in China 2,800 years B. C. It is the staple food of one third of the inhabitants of the world. Experiments in rice culture have been tried, along the rivers and marshy lands, with somewhat satisfactory results. The plant is very hardy.

CHAPTER VII.

THE WILD FRUITS OF CALIFORNIA.

[This chapter has been especially prepared for this report at my request by Prof. E. J. Wickson, of the University of California. Prof. Wickson is the author of a practical treatise entitled "California Fruits, and How to Grow Them," which is a valuable guide to beginners in fruit culture in this State, and describes the most successful local practices.—B. M. Lelong, Secretary.]

The wild fruits of California are numerous, and for the most part peculiar to the region, being either of local genera or local species of more widely distributed genera. Very few are identical with the wild fruits common to great areas of the continent. For this reason our wild fruits constitute a very interesting subject for botanical study, and they are now, perhaps more widely than ever before, attracting the attention of botanical pomologists. Viewed from the standpoint of practical pomology or horticulture, our wild fruits cannot be claimed, on the whole, to have attained any very great importance.

A few fruits, as will be noted further on, have demonstrated their culinary or household value, and are locally sought for, but none have any notable commercial value. This may be due to the fact that some of our most delicious wild fruits are very exacting in their choice of conditions, and cannot be moved far, even within the limits of our own State, and presumably would not take kindly to longer journeys.

Another reason why we have made little of our own wild species is found in the fact that our climate favors the superior growth of the best improved fruits of nearly all parts of the world. Therefore, we have little occasion for recourse to the improvement of local wild fruits, because of superior hardiness and adaptation, as has been done in other parts of the country. Neither fruit planters nor propagators have given any special attention to the wild growths, either for fruit or for stocks, although a beginning has been made in both these directions, which may ultimately attain importance. For this reason our notes upon California wild fruits will be a combination of botanical allusions and utility records, with only an occasional reference to cultivation. The horticulture of California wild fruits is a thing of the future.

The distribution of our wild fruits is determined by limitations of areas of similar climatic conditions. These are well outlined in other parts of this volume. In a general way it may be said that fruits are most abundant in foothill and mountain regions, and that our great valleys have always been practically destitute of them, except along stream borders. These fruits are most abundant in the northern portion of the State, but some exist throughout the State, usually thriving at higher elevations as they proceed southward.

OREGON CRABAPPLE.

(*Malus rivularis*.)

This fruit, though more abundant in the more northerly regions of the coast, as its name indicates, is found in the northwest counties of this State. It chooses a moist situation, becomes a tree 15 to 25 feet high, shows white bloom, and red or yellow oblong fruit, about half an inch long. The flavor is rather acid, but the fruit is eaten by the Indians, and was sometimes used for jelly-making by early settlers.

WILD PLUM.

(Prunus subcordata.)

This must be regarded as one of the most useful of our wild fruits. Even now, when the plum varieties of all the world have been introduced, residents in some of the Sierra regions, where an excellent variety (*Kelloggii*) abounds, prefer it to the cultivated fruit, both for eating and preserving.

The typical species is widely distributed over the mountainous regions of the State, and is a low shrub with white bloom and fruit three quarters of an inch long, of red color and inferior pulp. The better variety has a narrower range, forms a larger shrub, and bears a yellow fruit, larger and better than the typical species. Some attempts have been made to improve this variety by cultivation and selection of seedlings, and the results are promising, as fruit has been shown at our fairs notably better than the wild gatherings. The roots have also been used to some extent as stocks, but seem to possess no marked advantage. Mr. Felix Gillet, of Nevada City, reports that grafting an improved plum on the wild stock seems to cause the root to grow to much greater size than natural to it. Observation upon grafted and non-grafted seedlings in the same nursery row convinced him of this behavior. Other experimenters have condemned the stock because of dwarfing and suckering.

In early days the wild plums in the mining regions of the mountains were largely made use of and are highly praised by pioneers.

OSO BERRY.

(Nuttallia cerasiformis.)

This fruit is sometimes called the "California false plum." It has a plum-like form, and is of a rich, blue-black color, but is bitter, though not disagreeable to birds and animals, which feed upon it. The white bloom of the shrub has an almond odor. Used as a stock, the plum varieties grafted upon it have been dwarfed.

WILD CHERRIES.

(Cerasus sp.)

Quite a group of wild fruits come under this generic grouping, and they have marked and widely different characteristics. One (*Cerasus demissa*) closely resembles the Eastern chokecherry, and bears its round, red, or dark purple fruit on a raceme. This species has proved of some utility both for its fruit and as a stock for grafting in early days when better cherry stock was not available. Another species (*Cerasus ilicifolia*) has evergreen foliage, and is a useful hedge plant.

Of species bearing fruit in umbels, or true cherry style, we have two. *Cerasus emarginata* makes a handsome tree, sometimes 30 feet high, but its oval, dark red fruit is quite bitter and astringent. The other species (*Cerasus Californica*) bears bright red fruit intensely bitter.

CALIFORNIA GRAPE.

(Vitis Californica.)

Along our streams the native grapevine attains large size and fruits freely, the fruit resembling the "frost grape" of the East. The vine frequently covers and sometimes kills large trees with the density of its

foliage. Some variation is reported in the species, but it is possible that some of the better kinds are seedlings from some imported species, bird planted. The species has attained something of a reputation as a phylloxera-resisting root for grafting, but it has proved exacting in its choice of soils and situations, and otherwise not desirable, and some Eastern species are now relied upon for this service.

ELDERBERRY.

(Sambucus glauca.)

The elderberry makes a fine tree in California, sometimes 20 feet or more in height, and with a trunk a foot and a half in diameter. The fruit is borne in large quantities and is used to some extent.

RASPBERRIES.

(Rubus sp.)

In the mountains of the eastern part of the State is a scarlet hemispherical berry of pleasant flavor which is called "thimble berry" (*Rubus parviflorus*). It seems to have an advantage over a variety (*velutinus*) of the same species which is found near the coast and has a dry, insipid fruit. Another raspberry, which is found in all hilly and mountainous regions, both on the coast and in the interior, is *Rubus leucodermis*. It resembles the black cap raspberry of the Atlantic slope, except that it has yellowish-red fruit. This fruit is quite largely gathered for domestic uses, and some efforts have been made to cultivate the plants.

SALMON BERRY.

(Rubus spectabilis.)

The beauty, size, and delicious flavor of this fruit are highly commended by all who have enjoyed it in the upper coast counties of California and farther northward. The plant makes a strong bush, five to ten feet high, and it delights in woods and shady banks of streams. The praise of all who know the fruit has led to frequent attempts to introduce the plant to warmer and drier parts of the State, but such efforts have thus far uniformly failed.

WILD BLACKBERRY.

(Rubus vitifolius.)

This fruit should perhaps be called a "dew berry," as it has trailing, or, at most, but partially raised stems, which extend from five to twenty feet. The plant occurs abundantly on banks of streams and other sufficiently moist locations both in the coast and interior regions of the State, and the fruit has been held in high repute ever since pioneer days. In some parts the crop is considerable, and is turned to some commercial account. The fruit is oblong, black, and sweet. The species is variable, and the anomaly, a white blackberry, has been reported from Del Norte County.

WILD STRAWBERRIES.

(Fragaria sp.)

We have in California two Eastern species: *Fragaria vesca* and *F. Virginiana*. Thus far these have only been reported from localities in the Sierra mountain region. Another has been found identical with a

South American species, *Chilensis*, and it occurs along the coast, where the fruit is esteemed, and is sometimes abundant enough to gather in quantity. A fourth species is local, and is named *Californica*. It bears a small round fruit and is partial to the coast region. Recently some cultural attention has been given to the wild strawberry, and a variety worthy of propagation is reported by two growers resident in the Sierra region.

WILD GOOSEBERRIES AND CURRANTS.

(*Ribes* sp.)

Some of our currant species are achieving quite a reputation abroad as ornamental shrubs, but they bear insipid fruit. The fruit of *Ribes tenuiflorum* is, however, more agreeable, and is esteemed by dwellers in its region, which is the mountain region of the extreme north of the State. We also have a species (*bracteosum*) which has something of the black currant flavor and a fair-sized fruit.

There are also several species of *Ribes* which are classed with the gooseberries, but only three bear edible fruit. One of these (*Ribes divaricatum*) is peculiar to this coast; another (*Ribes oxyacanthoides*) occurs at an elevation in the Sierra Nevada and thence extends eastward beyond the Rocky Mountains. The berries are small to medium, of pleasant flavor, and well armed with spines. Another species (*Ribes quercetorum*) is common in San Luis Obispo and Kern Counties, resembles the flavor of the cultivated gooseberry, and is free from spines.

CRANBERRIES.

(*Vaccinium* sp.)

We have several species belonging to the same botanical genus as the Eastern cranberry, but quite different from it both in growth of plant and character of fruit. The fruit of two species is reddish, but insipid. Other species have dark blue or purple fruit. Some of these are locally esteemed, and the argument drawn from them is that the cranberry of commerce would succeed. It should be stated, however, that the situations in which these plants thrive are not at all according to the requirements of the bog cranberry.

OTHER BERRIES.

There are many small, wild fruits which are commonly designated as berries, which are of considerable botanical interest. The fruit, too, may be said to be edible, judging by the taste of Indians, birds, and wild beasts, but which are not likely to be much more than ornamental in the eyes of white people. They may be briefly enumerated:

The "manzanita" (*Arctostaphylos manzanita*), the "little apple" of the Spaniard, bears a rather dry but sub-acid fruit.

The "bear berry" (*Arctostaphylos uvaursi*) is esteemed by Indians both as food and medicine.

The "salal" (two species of *Gaultheria*), small fruit, either red or purple, is also a favorite of the aborigines.

Of "barberries" we have three species of *berberis*. One, *aquifolium*, is called the "false Oregon grape," chiefly notable for its handsome bloom, which has been chosen the State flower of Oregon. Another species (*nervosa*) has a larger fruit, which is esteemed in cookery; and a third species (*pinnata*) bears a small, pleasant-flavored fruit.

Our "service berry" (*Amelanchier alnifolia*) is from a quarter to a third of an inch in diameter and of a purple color.

The "lemon berry" is a fruit of *Rhus integrifolia*, and is coated with an acid exudation which is said to dissolve in water and make a pleasant drink. The fruit of *Rhus lobata* is said to have both a sweet and an acid coating.

The berries of the "toyon" or "tollon" (*Heteromeles arbutifolia*), or "California holly," are said to be eaten by Indians, but they serve the white people a better purpose in Christmas decorations.

The "jujube" of commerce (*Zizyphus jujuba*) has a local relative in *Zizyphus parryi*, which is, however, dry and mealy, rather than juicy.

WILD NUTS OF CALIFORNIA.

The wild nuts of California are of very little commercial importance. The wild almond (*Amygdalus Andersonii*) of the eastern slope of the Sierra Nevada is only of botanical interest, and little more can be said of the California filbert (*Corylus rostrata*), which has none of the quality of the improved filberts nor even of the wild hazelnut. Our chestnut (*Castanopsis chrysophylla*) has a sweet kernel, but a hard shell, almost like a hazelnut. Our native walnut (*Juglans Californica*) is better in flavor than the Eastern black walnut, but its hard shell makes it of little commercial account in competition with better cultivated nuts.

The one native nut which is regularly sold in the local market is the "pinenut"—seeds of several species of Pacific Coast pines. Their flavor is somewhat resinous, but is agreeable.

The seeds of two species of palms, *Washingtonia filifera* and the Lower California *Erythea armata*, are sought for by the Indians, who also eat the sweetish fruit of the *Yucca baccata*, which somewhat resembles in shape the banana, and in flavor the fig.

The Indians also use the acorns of several species of California oaks as food, extracting the bitterness by soaking in water and then making a rude bread of the acorn meal.

CHAPTER VIII.

A DESCRIPTION OF THE COUNTIES OF THE STATE.

ALAMEDA COUNTY.

Alameda County fronts the bay of San Francisco, and lies opposite to San Francisco and the Golden Gate. It is bounded on the north by Contra Costa County, on the east by San Joaquin County, south by Santa Clara County, and west along its entire length by the bay of San Francisco. Its area is 737 square miles, or 512,000 acres. For a distance of 36 miles, Alameda County fronts upon the bay, with an average width of 25 miles, extending to and beyond the summit of the Contra Costa Hills, comprising numerous beautiful valleys, besides the broad Alameda Valley, which last is bounded by the waters of the bay on the one side and the Contra Costa Hills on the other, and is one of the richest and most fertile valleys in the State. Among the most important of the smaller valleys are Livermore, Sunol, Castro, Amador, and Moraga,

all richly endowed by nature with most productive soils, where flourish the grape, olive, fig, orange, and most of the semi-tropical fruits, and beautified with perennial flowers. The Contra Costa Hills, themselves, are well adapted to the cultivation of the olive, and the time is not far distant when the whole range of hills will be covered with the beautiful trees.

The principal stream in this county, Alameda Creek, rises in the Mount Diablo range, near Livermore Pass, and running through a cañon in the Contra Costa range, empties into San Francisco Bay, supplying water power for several mills on the way. It is also navigable for schooners and light-draught crafts for several miles. There are several other creeks crossing the county and emptying into the bay, two of which furnish water for the city of Oakland. By the construction of a high dam at a narrow gorge in the hills, San Leandro Creek is made to form Lake Chabot, half a mile in width by 2 miles in length, and 280 feet in its deepest part.

The range of hills, as has been stated, extending the whole length of the bay-front of the county, at a distance from the bay ranging from 5 to 10 miles, reach their highest altitude at Mission San José, at the southern end of the county, in Mission Peak, the highest point being 2,275 feet above tide-water. In early days these hills were covered with giant redwood trees; some of the old stumps remaining measure from 6 to 10 feet in diameter. The timber was cut away by the early pioneers, the lumber being used to build up San Francisco in the palmy days of '49 and '50, until scarcely a redwood is found of any dimensions.

The country around Haywards was once a great grain-growing region, but its special adaptability for fine fruits is causing large tracts to be set out in orchards. Even now this district is one of the great fruit-raising regions, many millions of pounds being annually shipped.

The soils of this county that are immediately along the bay in Alameda Valley and the marshes formed by the overflow, are heavy, but very fertile when reclaimed. Then comes a broad belt of rich, black adobe. This belt is crossed by sedimentary deposits of alluvial land made by shifting channels of streams running down from the Coast Range. In the Niles region are lighter loams. About Livermore are uplands, bench, and valley lands. Between the latter two classes the difference in potash, lime, and phosphoric acid accounts for difference in grape crop.

Mission San José is characterized by gravelly, upland, adobe soil, and was evidently chosen by the padres of the old Mission for its exemption from frost, caused by its slight elevation above the surrounding valleys.

At Pleasanton the section tributary consists of agricultural and grazing lands. The soil is very rich sediment bottom, producing hay, grain, potatoes, hops, and beets in abundance.

At Alvarado the surrounding country is a fine farming and fruit region, and gardening and dairying are also largely carried on. The fertile, alluvial soil of the country about is finely adapted to fruit growing.

The climate of Alameda County is unsurpassed for equability and salubrity, never reaching the extremes of heat or cold, the nights being always cool. Bordering on the bay, it is subject to frequent fogs during the spring months, but these are not usually dense or of long duration. It is sheltered from the chilly winds of the ocean by the peninsula of

San Francisco and the intervening bay. In the interior the climate is unlike that of the coast, being hotter and drier. This is true especially of Livermore Valley. The highest temperature here in 1891 was but little over 100°, and the rainfall for that year was 17.05 inches.

Alameda County ranks as one of the leading fruit counties in the State. It was one of the earliest to be devoted to the production of deciduous fruits upon a large scale, and the success which has attended all the experiments made here has done more than anything else to encourage the development of this pursuit in other parts of the State. The orchards, which extend all the way from Oakland to the boundary of Santa Clara County, occupying the wide belt of alluvial soil between the bay shore and the hills, and even covering those hills and extending into the valleys beyond, can hardly be excelled in productiveness by any equal area in the world. Every kind of fruit and vine flourish in this county. Cherries, currants, and gooseberries are shipped to other parts of the State. In the production of cherries, Alameda stands at the head. More cherries are shipped to Eastern markets from this county than from all other parts of the State. Although fruit growing long since became a favorite industry in this section, the grain farmer still maintains his hold.

In a sketch of the horticultural growth of Livermore Valley, W. P. Bartlett speaks as follows:

"A few family orchards were planted from time to time, and conscientiously neglected all the time; and it is within the past ten years that an orchard of more than an acre or two could be found in Murray Township. We have to-day upward of 1,500 acres of commercial orchard, all young, cared for properly, and protected from disease and the assaults of insects.

"These plantings have mostly been made with a clear discernment of the needs of the various fruits in the matter of soil and climate, and it is therefore probable that the proportion of failures will be less than is usual in inaugurating an industry in a new country. I once heard a prominent orange grower at Riverside, who began when land could be bought for little or nothing, say, that he had better have paid \$1,000 an acre and had it with the experience he had gained in planting wrong varieties.

"But, fortunately, there was, for the keen men who were our first orchard planters for profit, an infallible guide to success. At this day it may seem strange to so state in view of the poor, broken-down, forlorn-looking, neglected orchards of the wheat farmer, pointed at by every one as proof that fruit growing was a failure in this valley. Remnants of these orchards still exist in favored localities; where fairly well cultivated, entire plantings exist and bear fruit. But generally only a few trees remain. And these are what? The pear, the almond, and the apricot. The rest are either dead or merely dragging out a miserable existence. Apple, peach, plum, prune, cherry, all have succumbed to neglect and bad management, only these, then, being left to tell the tale. The almond and pear produce considerable fruit. The apricot misses pruning and is sulky, but makes a large tree nevertheless. There is a small orchard near the Martin ranch, 7 miles north of Livermore, where the trees are but 19 feet apart, have never been pruned or cultivated for twelve years, and are open to the incursions of stock. Yet the pear trees bear heavily every year. I have seen barrels of fruit on a single tree.

"With good cultivation, on rich soil, the pear flourishes here, delighting in our dry air, which represses the slug and prevents mildew, that enemy of the sets in moist climes. The fruit, too, is large and firm, and will stand shipment, while that grown in fogs will not.

"The almond has been largely planted here, and is essentially a dry-air tree. It is later in coming into bearing here than in some other localities, but is a heavy producer when it does begin bearing. Mr. Hatch's El Primo orchard, planted in 1886, bears its first fine crop this season, though the trees are of large size. No insect enemies have appeared.

"The apricot bears young, makes a fine, large tree, stands erect against the wind, and unless its tendency to overbear is strongly checked by either spartan pruning or heroic thinning, the fruit is apt to be small.

"The peach does well here in protected spots, on naturally sub-irrigated land.

"The olive thrives, and after the third year makes a vigorous growth, bearing in the sixth. Its productiveness is something marvelous. All the Rock importations, and several others, have fruited here. All bear regularly, and nearly all are extremely prolific. The tree has no enemy here but the twig borer, which does little harm.

"The White Adriatic fig makes a good growth here, but the first crop is small, and the second is mostly cut off by the frost. Experiments in cultivation and treatment may cure the defect. It has no enemy but the gopher.

"The prune is not a success, excepting, perhaps, on the moist loam land about Pleasanton. In our best orchard, the fruit runs 100 to 110 to the pound—entirely too small. This tree requires fogs. In the Santa Cruz Mountains it branches out like an apricot; here it runs up like a cherry. This close habit allows the sun to scald the bark, and the tree is gone.

"The cherry, except in a few dry spots, is practically a failure for the same reasons.

"The apple tree planted here often brought the woolly aphis from the nursery; and as if that were not enough, our dry air and soil do not agree with the tree.

"Insect enemies are not numerous, and do not give such trouble to the fruit grower as about San Francisco Bay.

"The pernicious scale has often been introduced here, but has made no headway, being, I believe, killed by our dry north winds. I have witnessed three instances of the destruction of the scale in this way, and believe that whenever it is exposed to the direct effects of this wind it is destroyed. What this means to the orchardist can only be appreciated by those who have fought this pest.

"The apricot and pear do best on our heavier and richer loams, and light alluvial and loose gravelly loams. The olive thrives best on deep, well-drained, rich vegetable loams, and not on shallow soils and rocks, as is often stated.

"In fruit, as in all else, we attain quality rather than size, though culture, close pruning, and thinning will give us this quality as well."

Very little irrigation is done in Alameda County, and but one canal of any extent is found here. This is owned by the Murray and Washington Water Ditch Company, is 5 miles in length, and is assessed at \$1,100.

About Newark and Alvarado there is a very large substratum of

artesian water, and some fifty wells are now in active operation. These vary in depth from 200 to 400 feet, and cost for clear work \$1 50 per foot for sinking. There is a plan now on foot to supply Oakland with water from these wells by means of large pumps and a reservoir.

Alameda is a very large producer of cherries, apricots, peaches, plums, pears, prunes, and berries, a large part of which find a market in San Francisco, Oakland, San José, and Sacramento, but the greater part is shipped to Chicago and the East. The greater portion is shipped green. This is packed in 25 and 60-pound boxes. Much of the second-grade fruit is shipped to the canneries in San Francisco, Oakland, and San José. The output of fruit from Alameda County for 1891 is estimated at 1,000,000 pounds.

For the present season a shortage in nearly all classes of fruit is reported, but the increased prices received have more than compensated for the shortage.

ACREAGE AND VARIETY OF FRUITS IN ALAMEDA COUNTY.

Variety.	Acres in Trees.			
	Bearing.	Non-Bearing.	Total.	Plant of 1892.
Apple	435	70	505	12
Apricot	2,630	680	3,310	230
Cherry	1,743	428	2,171	87
Fig	21	3	24	2
Olive	32	5	37	3
Peach	963	412	1,375	157
Nectarine	176	231	407	78
Prune	1,860	491	2,351	182
Pear	1,384	317	1,701	120
Plum	1,664	221	1,885	76
Quince	3	1	4	—
Persimmon	1	—	1	—
Lemon	7	5	12	1
Orange	1,012	225	1,237	67
Nuts—Almond	28	8	36	2
Walnut	3	1	4	—
Chestnut	1,087	256	1,343	256
Small fruits	—	—	—	—
Totals	13,050	3,354	16,404	1,273

The principal fruit section of Alameda is found near Alameda Creek, the belt extending about a mile on each side of the creek. The soil here is a rich, black loam, with little sand, and is well adapted to the growth of peaches, apricots, cherries, plums, and pears. Centerville, Niles, Haywards, San Lorenzo, San Leandro, Mission San José, and Irvington, are all centers of important fruit regions.

ALPINE COUNTY.

Alpine County is one of the mountain counties of California, and its principal industries are mining and lumbering. It has but a small population, the last census giving it at 667. Its geographical boundaries are, north the State of Nevada, east Mono, south Tuolumne, and west El Dorado, Amador, and Calaveras Counties. Its area is 882 square miles, or 535,000 acres. Its cultivated lands will not reach 1,000 acres.

The county is a succession of mountain ranges, with high and precipitous peaks, interspersed with numerous lakes, rivers, creeks, and beautiful valleys. Silver Mountain is the highest peak in the county, having an altitude of 10,000 feet. The town of Silver Mountain is situated at or near the base of this mountain. Round Top is another one of Alpine's towering peaks; it is 10,600 feet high. There are numerous small lakes throughout the county, the waters of which are clear and cold. Many of them contain the mountain trout. Of these are Blue Lakes and Caples Lakes, in the eastern part of the county. The county is bountifully supplied with brooks, creeks, rivulets, and rivers, many of them heading up in the mountains, fed by the numerous lakes and the melting snow, which keeps them running through the summer season. The Carson River heads in the southern part of the county, and flows from south to north through the county. It is fed by numerous streams, viz.: the East Fork of Carson River, the West Fork of Carson River, and Wool, Silver, Monitor, Smith, Mogul, and Indian Creeks.

Among the mountains are numerous valleys. The largest and most noted are: Diamond, Hermit, Pleasant, Hope, Faith, and Charity. Diamond Valley lies in the northeastern part of the county, and contains some very rich, productive ranches, producing wheat, barley, hay, oats, and potatoes. The three sister valleys of the county—Faith, Hope, and Charity—are located in the northwestern part of the county, at an altitude of 7,500 feet above sea-level. These valleys are inhabited only during the summer months, and then by stock raisers and dairymen. The dairy interest in these three valleys is of considerable importance, and more than 30,000 pounds of butter of an excellent quality are produced annually. Pleasant Valley is near the town of Markleeville, where considerable hay is cut and marketed to the residents thereabouts. There are many other small valleys throughout different parts of the county, where sheep and cattle are grazed during the summer season. The nutritious bunch grass, which grows so luxuriantly in those mountainous regions, is of an excellent quality, and stock fattens very rapidly upon it.

The entire western section of the county is a wild, mountainous region, whose grandeur of scenery vies with the Alpine regions of Europe. From November till late in June the region is wrapped in a mantle of snow, varying in depth from two to fifty feet; during the remainder of the year it forms a vast mountain pasture for thousands of sheep and cattle that are driven there from the lowlands of the State to feed during summer and fall. The greater part of the surface of this mountainous region, as well as of the lower and eastern section of the county, is covered with forests of heavy and valuable timber. All the coniferous trees common to the western slope grow to a large size on all the mountain sides. When the Comstock was in its zenith the wood and lumber business of the county was quite an important factor in its activity, but since the decline of the mines there this branch of business has been greatly crippled; yet there are annually cut from 15,000 to 20,000 cords of wood and 750,000 feet of lumber sawed.

In the eastern part of the county farming is carried on to a considerable extent. Upper Carson, Diamond, and Dutch Valleys are the chief seats of this industry. In the elevated valleys among the mountains, summer dairying is an important industry.

The many beautiful lakes high up among the mountains are favorite

summer resorts. The Blue Lakes, especially, are becoming a famous rendezvous for summer pleasure-seekers. In many parts of the county are mineral springs, both hot and cold.

The climate of Alpine County is, as its name and topography would indicate, decidedly alpine in character. With its western boundary in the high Sierra, and its whole area in the mountains, its winters are long and rigorous, and its snowfall deep.

In the valleys the soil is a heavy alluvium, very rich and fertile and yielding heavy crops where properly cultivated. But little fruit is grown in this county. Some very excellent apples and pears are produced, but owing to its remoteness from market, and lack of transportation facilities, little finds its way into the market, the entire output being used for home consumption.

ACREAGE AND VARIETY OF FRUITS IN ALPINE COUNTY.

Variety.	Acres in Trees.			
	Bearing.	Non-Bearing.	Total.	Plant of 1892.
Apple.....	8	7½	15½	1
Apricot.....	½	½	1	—
Cherry.....	½	½	1	—
Peach.....	1½	2	3½	2
Prune.....	1	1½	2½	1
Pear.....	1	—	1	½
Plum.....	1	—	1	—
Table grapes.....	2½	—	2½	—
Small fruits.....	—	—	—	—
Totals.....	16	12½	28½	4½

Some little irrigation is done here, and a number of ditches, diverting water from the mountain streams, have been constructed. These, however, are principally for mining purposes. They aggregate 16 miles in length and are valued at \$3,760.

WATER DITCHES IN ALPINE COUNTY.

Name.	Miles.	Assessed Value.
West Carson River Ditch.....	3	\$1,500
Deluchi Bros. Ditch.....	1	200
Diamond Valley Ditch.....	2	600
Welch & Gallaner Ditch.....	4	900
Thompson Ditch.....	2	300
Markleeville Ditch.....	2	160
Riverside Ditch.....	2	100
Totals.....	16	\$3,760

AMADOR COUNTY.

Amador County belongs exclusively to the foothill section, and has an area of 650 square miles, or 416,000 acres. It is bounded on the north by El Dorado, south by Calaveras, east by Alpine, and west by San Joaquin County. It is very irregular in shape and extends from the summit of the Sierra Nevada range to the Sacramento Valley. The eastern

portion is very narrow, and for a distance of 25 or 30 miles is embraced within the upper foothills region, having an elevation of from 2,000 to 4,000 feet above the sea; its surface is rugged and broken, the streams finding their way through deep cañons, and the mountains are well timbered. The rest of the county, or lower foothills region, is hilly and partly timbered, and is interspersed with numerous fertile valleys varying in length from 3 to 6 miles and in width from 2 to 3 miles. Ione and Jackson Valleys are each 12 or 15 miles long and from 2 to 5 miles wide. The soil is a red loam, more or less gravelly, with a scattered growth of oaks.

The county has a length from west to east of about 55 miles, with an average width of 12 miles, and varies in altitude from 335 feet above ocean-level at Ione City to over 800 feet in the northeastern part.

It is difficult to describe the climate of Amador, varying as it does in consonance with the varying topographical features of the county. In the lower portions the summer months are like those of the Sacramento Valley—the days usually warm, sometimes hot, with breezes in the afternoon and cool nights. The winter months are pleasant, with occasional frosty mornings and an average rainfall the same as Sacramento. As a higher altitude is reached a different climate is found; cool and spring-like in the summer, and decidedly wintry in the winter months, with biting frosts and heavy falls of snow.

The average rainfall at the two principal points in Amador County, from the records of the past ten years, is as follows:

	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Ione.....	2.62	3.07	3.89	3.96	1.17	0.42	0.00	0.00	0.23	0.39	1.26	2.62
Jackson.....	5.25	5.85	5.59	5.30	1.56	0.33	0.00	0.00	0.23	1.88	2.06	3.76

The soil in Amador ranges from a heavy alluvium in the lower portions of the county, with a large admixture of adobe, through the redlands of the foothills, to a gravelly loam in the higher hills and the granite formations of the mountains.

At Ione the soil is an alluvial deposit, deep, rich, and very fertile. Advancing toward the foothills this changes to the red adobe characteristic of the whole foothill region of the Sierra, very heavily impregnated with iron, and in which is found some of the best fruit land of the State. In the higher foothills the red land becomes more gravelly, until, as it reaches the higher altitudes, rocky would better describe it. Along the Mokelumne River bottom, where the best fruit farms are found, a deep black loam prevails. The "Q" Ranch, the principal fruit farm of Amador County, is planted in this soil, and its returns are very large.

Irrigation is not needed in Amador, but as one of the results of early mining operations in Amador, the county is traversed by innumerable canals and water ditches, which can be utilized, if necessary, for irrigation purposes. These canals and ditches are supplied from never-failing sources. The county is also singularly favored in the matter of water power for manufacturing purposes, and some day these great agents of commerce will be utilized. It is bounded on the north in part by a fork of the Cosumnes River, and on the south by the Mokelumne River. Numerous creeks, flowing independently of these rivers, aid in supplying the county with an abundance of water. There are several canal

systems which supply water in Amador County, but the greater part of them are for mining purposes only, and some are dry during the irrigating season. The two principal companies are the Blue Lakes Water Company, which supplies the districts of Jackson, Sutter Creek, and Amador, and the Campo Seco and Mokelumne Hill Flume Company, which supplies the districts named in the title. These are both mining systems, and water for irrigation is supplied incidentally. Where the water is used for irrigation purposes the orchardists pay 25 cents per miner's inch for a twenty-four hours' flow, and it is used about four times in the season, between May and October.

Several small reservoirs have been built to save the winter water and lengthen the summer flow. Of these one is at the New York Ranch, one at Tanners, one near Sutter Creek, one near Plymouth, and one near Amador. These are all of small capacity, built for mining purposes only, and controlled by the Blue Lakes Water Company.

The following table gives the names of the canals, length in miles, and their assessed valuation:

Name.	Miles.	Value.
Amador, Volcano, and Walsh.....	10	\$10,000
Buckeye.....	3	1,500
Lancha Plana.....	6	3,000
Home.....	3	1,500
Plymouth.....	16	10,000
Amador and Sacramento Canal.....	15	15,000
Cosumnes or Puritan Ditch.....	10	11,500
Blue Lakes Water Company's Canal.....	40	125,000
Minor private canals.....	5	3,300
Totals.....	108	\$180,800

Besides these there are a number of smaller ditches taken direct from the rivers by farmers living along their courses.

The western portion of the county is admirably adapted to fruit growing. The same citrus belt traverses this county that enriches the northern counties of Butte, Nevada, and Placer, and some oranges and lemons of remarkable size and flavor have been produced here. The fruits grown in Amador are numerous in variety, and include peaches, apples, plums, prunes, grapes, nectarines, figs, and pomegranates. Grapes of all kinds do well, and some very excellent Zante currants have been produced. Nuts do well also, and the English walnut, almond, chestnut, hickory nut, butternut, hazelnut, and pecan are all found here. In the higher foothills apples do wonderfully well, attain a great size and fine flavor, and possess very superior keeping qualities.

The principal fruit sections of Amador are Ione Valley, Jackson Valley, Jackson, and Sutter Creek, in the order named. Grapes are the favorite fruit in most parts of the county, as they thrive on the rich foothill soil, grow without irrigation, and require little attention. After grapes will follow peaches, apples, prunes, plums, apricots, pears, and other deciduous fruits in minor quantities. Olives and figs wherever grown do well, but no attention has been paid to these fruits for commercial purposes on an extensive scale.

ACREAGE AND VARIETY OF FRUITS IN AMADOR COUNTY.

Variety.	Acres in Trees.			
	Bearing.	Non-Bearing.	Total.	Plant of 1892.
Apple.....	112	15	127	5
Apricot.....	50	65	115	50
Cherry.....	10	8	18	3
Fig.....	20	14	34	5
Olive.....	1	7	8	1
Peach.....	120	223	343	180
Nectarine.....	8	18	26	7
Prune.....	30	184	214	112
Pear.....	41	30	71	18
Plum.....	10	23	33	12
Lemon.....	-----	1	1	1
Orange.....	-----	2	2	1
Nuts—Almond.....	12	32	44	15
Walnut.....	3	6	9	2
Raisins.....	3	-----	3	-----
Table grapes.....	5	-----	5	-----
Small fruits.....	20	-----	20	-----
Totals.....	445	628	1,073	412

The fruit crop of Amador this season has been very light. Peaches in most parts did not yield over half a crop, and in the most favored localities not more than two thirds. Apples were about the same, and so with most other fruits, except pears, which were reported as average.

Stockton is the nearest important town to Amador County, and most of the fruit exported finds its way there; some is sent to San Francisco and Sacramento, where it is consumed by the canneries.

BUTTE COUNTY.

Butte County, which has earned the right to a position in the front rank of the horticultural counties of the State, is located in the extreme northeast portion of the Sacramento Valley, and is bounded on the north by Tehama, east by Plumas, south by Yuba, and west by the Sacramento River. Its width is about 60 miles, and its extent north and south 8 miles, passing the 39th and 40th parallels of north latitude. This area is divided between valley, foothill, and mountain. Of the hill lands 200,000 acres are timbered and 240,000 acres are mineral. It embraces 1,720 square miles, which may be divided into 160 square miles of mountain, 965 square miles of foothill, and 595 square miles of valley land. Of the valley land 70 square miles consist of treeless abode soil. The Sierra Nevada Mountains on the east are not lofty nor precipitous, and there are no high peaks upon which the snows of winter remain during the summer months. The mountains are heavily timbered, and filled with grassy meadows.

Along the western boundary of the county, for its greater part, the Sacramento River runs, while in a northerly and southerly direction the county is bisected by the Feather River. Butte and Chico Creeks, two streams of considerable volume, run the greater part of their length through the county, while Pine, Mud, Deer, Edgar, Little, and Big Butte Creeks, and a large number of minor streams, find their source in the adjoining mountains and debouch on the plains of Butte, making her one of the best watered counties of the State.

The climate is almost as varied as are the topographical features. In the lower foothills and valleys the weather is mild and equable, with occasional hot days in the summer months. The winter climate of the valley is never severe, and frosts are of rare occurrence. A thermometrical record, kept for sixteen years, does not show the mercury to have touched a lower point in all that time than 22° above zero. In the higher foothills the heat is less intense in summer, nor is the cold so severe in winter. In the high mountains an Eastern climate prevails in the winter, and during the summer the air is spring-like and balmy.

The soil may be divided into four classes. Around Biggs, Nelson, and Durham a black adobe prevails, which has been found better adapted to cereals than to fruit growing. At Dayton, Chico, and Nord the character changes to a mixed clay and adobe, which is considered good grain, hay, and fruit land. Then come the red lands of the foothill regions, found excellent for fruit, and by many experts considered the best soil for horticultural pursuits. This, if summer-fallowed, yields heavy returns in hay and grain. In the river bottoms and along the southern portion of the county, it becomes a sandy loam, very rich, easily worked, and deemed equally good for all classes of vegetable growth. The western portion of the county is an extended plain, exceedingly fertile, and capable of producing in abundance fruit and cereals of almost all varieties.

The soil of the bottom land that borders the river is so little above the river level, and the soil is such a light alluvium, that the water of the stream percolates through it and keeps it moist and in fine condition for grain, grasses, fruit trees, and in fact all kinds of vegetation, through the whole year.

With her numerous streams, abundant water supply, and topographical advantages, Butte possesses extraordinary facilities for irrigation works—a fact to which capitalists are already awakening. Two large canals, originally constructed for mining purposes, terminate at Oroville, and are now used for irrigation.

An immense scheme is now under way for diverting the water of Feather River, where it leaves the Big Bend tunnel, to the east and west into two large canals, which would give sufficient water to irrigate all the arable land of Butte and much of that in the adjoining counties. With the completion of these works many thousands of acres of land will be devoted to orchard and farm purposes which are now idle or held in large bodies for cereal culture. The Biggs "Argus" outlines the advantages to Butte from the completion of the great work, as follows:

"The completion of the Feather River Canal Company's canal from the Feather River to Biggs and then on via Gridley to the Buttes, also the branch canal which will convey a large stream of water in a northeasterly direction through the redland section up by Shippee's and Nelson, is going to be a big factor in the greater development of the fruit interest of this section. While it is true that the river lands do not need irrigation for the growing of deciduous fruits, it is also true that water is necessary to grow nursery stock, especially June buds. So it will be seen that irrigation will be an advantage to the orchardists on Rio Bonito, even though they do not actually need it to produce excellent fruit. But the red lands lying on the east and northeast of Biggs, and extending even as far as Thermalito, are the lands that actually

require plenty of irrigation, especially for orange culture, which we believe will be eventually the principal tree planted in this soil. There are many thousands of acres of the red lands embraced in the territory above mentioned, and there is no land in the county that will grow finer oranges, lemons, olives, and grapes. The Rose place of 1,200 acres, now in wheat, and thousands of acres surrounding it, will, in the course of a few years, be devoted to fruit culture. All these red lands will be reached by the water from the canal, and when the canal is completed and the water is brought to the land, wonderful developments will follow. The canal company have the means in their hands of doing great good in western and southern Butte, and the people of this section are doing themselves and the country a grave injustice in not urging the completion of the canal at the earliest possible moment."

There are a very large number of canals in Butte, about equally divided between irrigation and mining. The greater part of the mining ditches supply water for irrigation also.

IRRIGATION WORKS IN BUTTE COUNTY.

Name.	Miles.	Assessed Value.
South Feather Water and Union Mining Ditch	53	\$280,000
Frank McLaughlin Mining Ditch	13	910
C. L. Cutting Mining Ditch	32	4,000
Palermo Land and Water Co. (irrigating)	39	19,400
Thermalito Colony (irrigating)	24	6,150
Spring Valley Gold Co. (mining)	50	4,500
Private ditches (mining and irrigating)	120	1,200
Totals	331	\$316,160

Horticulture in Butte County, while always receiving some attention, did not attain the importance it deserved until after 1886. In that year the first premium for citrus fruits was awarded her at the Northern California Citrus Fair, which event gave an impetus to the industry, and especially to the citrus branch of it. Since then wonderful strides in this direction have been made, until horticulture has become one of the principal industries of the county, and promises soon to overshadow all others.

The Gridley "Herald," speaking of the rapid growth of horticulture in this county, says that a few years ago the orchard area was very limited. Now it extends clear across the country to the Feather River, and each succeeding year witnesses a big increase devoted to fruit. Rio Bonito is the nearest colony; its 2,000 acres of orchard present a healthy growth and perfect cultivation. And the end is not yet. Every year now will see the prosperity of that section of country growing as rapidly as fruit trees grow in this favored locality. The land adjoining Gridley has, in fact, become too valuable for cattle grazing and grain growing; every acre of it is good for fruit, vines, nuts, and berries. Palermo and Thermalito colonies, in the citrus belt, appear as wonders of the age when it is known that the lands they include were, but a few years past, exclusively reserved to herds of animals. Now they are the home of the orange, fig, vine, and olive, possessing the possibility of making, if not a thriving town, at least a prosperous and important village.

With its great variety of soil, climate, and altitude, Butte is adapted to a wide range of varieties of fruit, and all, except that of the tropics, will flourish here. The apple of the north, the orange of the south, the cherry, the fig, the guava, and the pear, grow side by side, and all do well. The Assessor's report, which errs on the side of conservatism, shows that there are 770,000 fruit trees planted in this county, which places it seventh among the horticultural counties of the State, being surpassed only by Los Angeles, San Bernardino, San Diego, Santa Clara, Solano, and Sonoma. There are 118,012 orange trees, which places her fifth among the citrus counties. Besides this, Butte has 111 acres of wine grapes, 66 acres of table grapes, and 604 acres of raisin grapes, making in round numbers about 800 acres. But seven other counties show a larger area of vineyards.

The cherry is one of the favorite fruits. It grows to perfection, and is the earliest fruit in the market. The trees attain an enormous growth and bear wonderful crops. As a market fruit it has been found very remunerative. It will grow in most soils, but thrives best in the rich alluvium of the river bottoms. Its range of altitude is equally wide, and it does well from the side of the Sierra, 3,000 feet above sea-level, to the banks of the Sacramento River. In General Bidwell's orchard is one tree, from which a few years ago the fruit was weighed, and it produced in a single season almost a ton of cherries, netting nearly \$200.

The apricot is also a favorite, and does equally well with the cherry, with which it shares the popular esteem. It precedes the peach, ripening in the latter part of May and the early part of June. The varieties generally do well, and, like the cherry, flourish in all soils and at various altitudes. The tree grows vigorously, bears early, and the crop has been found a profitable one.

The peach finds its home in Butte County, and some of the trees here have been in bearing continuously for thirty years past. There is no part of the county where the peach will not do well if care is taken in the selection of stock for the soil, and any kind of care is bestowed upon the young trees.

Butte County produces some very excellent apples. The trees make a thrifty growth, are remarkably healthy, and bear very heavily. They have proved themselves a very profitable crop, and varieties do well in almost any part of the county, the mountain sides being especially adapted to their requirements.

Citrus fruits do well over a large portion of the county, and Butte is entitled to the position of leader in the northern citrus belt. Prior to 1886 citrus culture was largely experimental, although even at that date the fact that oranges would grow there and could be made a profitable crop had gradually forced itself upon the attention of fruit growers. The winning of the award at the Northern California Citrus Fair in Sacramento in 1886 confirmed the belief of the citrus growers there, and a great impetus was given to the new industry, until to-day Butte is better known for her production of citrus fruits than for those which have so far proved of greater commercial importance. The colonies of Thermalito and Palermo have taken their chief impetus from the fact that oranges will grow there. In the former colony large tracts have been set to citrus fruits, and the planting of orange trees has not lessened, but rather increased with time. During the past season among other plantings at Thermalito, Major Jones put out 1,200 budded

trees and 6,000 seedlings; F. S. Foote set out 2,200 Parson Browns, Mediterranean Sweets, and Navels; Colonel Dameke, 1,200 budded trees; Fred Stanton, 1,400 budded trees; E. C. Goodrich, 1,800 budded trees; Mrs. Goodrich, 5 acres; Major Risher, 1,800 trees; W. B. Martin, 2,000 trees, and Miss A. Briggs, 10 acres.

In figs Butte equals any section of California. The tree there grows very rapidly, bears early, and yields very large returns. Some White Adriatics, packed by Legget & Son last season, were remarkably fine, and were pronounced by those who saw them equal to the imported fruit.

Much attention has also of late years been paid to olives, which do well in most parts of the county. A great many trees are now in bearing with such good results that large areas of new land have been planted to this fruit.

Plums and prunes grow in all soils, and do well in all. A great deal of attention has been given to the growing and curing of the prune of late, and a number of large orchards have been planted in Butte, in all of which an encouraging advance has been made.

Among other fruits found here in commercial quantities are almonds, nectarines, quinces, mulberries, pomegranates, and all the small fruits, besides large areas in grapevines. There are over 1,000 acres in vines in the county, and at the Paris Exposition in 1887 the premium for raisins was awarded to Butte County. The first carload of oranges shipped from this State for the season of 1891-2 went from Butte County, having been shipped on December 12th.

Butte finds a market for her fruit at the Marysville cannery, her home cannery, and in the East and San Francisco. About 5 per cent of the output is consumed in the mining districts of the county. For Eastern shipments green fruit is packed in regulation boxes adopted by all Eastern shippers. Peaches, pears, and large plums are wrapped in paper. Grapes and plums are packed in four and five-pound baskets and crates. Dried fruit is packed in boxes of 25 and 50 pounds, or shipped in sacks, as demanded.

The output of different varieties for 1891, together with an estimate for 1892, is appended. The figures for the present season are gathered from the most authentic sources, and will not vary much from the official returns when the season is over.

OUTPUT OF FRUIT FOR BUTTE COUNTY.

	1891.	1892.
Peaches.....	5,529,260	6,000,000
Prunes.....	677,400	200,000
Nectarines.....	83,800	20,000
Apricots.....	385,900	90,000
Quinces.....	4,200	4,000
Almonds.....	188,000	300,000
Grapes.....	920,000	800,000
Pears.....	213,200	150,000
Plums.....	561,500	300,000
Apples.....	1,060,200	700,000
Blackberries.....	20,600	21,000
Cherries.....	165,200	10,000
Totals.....	9,809,260	8,595,000

The central and northern part of Butte County was visited by a severe storm in the spring, which seriously injured the fruit, and many kinds were almost destroyed. A large increase in peaches coming into bearing, made the total of this fruit larger than last year. The same is true as to almonds. Prices have ruled much higher this year for dried fruit, which more than compensated the grower for the shortage, as will be seen from the following statement of prices paid for dried fruits last year and this:

	1891.	1892.
Cherries.....	3¾ to 4½ cents.	7 to 10 cents.
Peaches.....	1¼ cents.	3 to 3½ cents.
Pears.....	¾ to 1½ cents.	1¾ to 3 cents.
Prunes.....	1¼ cents.	2½ to 3 cents.
Nectarines.....	1 cent.	2 to 3 cents.
Apricots.....	1¼ cents.	1½ to 2 cents.
Almonds.....	in hull ¼ cent.	soft, 13 cents.
Grapes.....	packed ¾ cent.	2 to 2½ cents.
Plums.....	¾ to ¾ cent.	2 to 3 cents.
Apples.....	½ to 1 cent.	1 to 1½ cents.
Blackberries.....	3 cents.	3 cents.

The output of dried fruits in Butte in 1891 was 1,100,900 pounds.

The principal fruit sections of Butte are Palermo, where are found conditions suitable to the growth of both citrus and deciduous fruits; Thermalito, for citrus, olive, fig, and deciduous fruits; Rio Bonito, in which the peach and almond excel; Chico, for almonds and deciduous fruits, and Oroville, for oranges, olives, and figs.

There has been a very large addition to the fruit acreage of Butte during the present season, some 1,500 acres having been planted since the opening of the year. This is divided among the various classes of fruit in the following proportion:

Deciduous fruits.....	66,800 trees.
Citrus fruits.....	42,980 trees.
Olives.....	35,800 trees.
Total.....	145,580 trees.

The oldest orchard in Butte is that of General Bidwell at Chico; following this were the Hilgas orchard, between Rio Bonito and Thermalito, the Guill orchard at Chico, and that of the Hon. John C. Gray at Oroville. The oldest orange tree in Northern California is at Bidwells Bar, and the oldest orange grove is that of J. Gardella at Oroville. The earliest fruits planted were peaches and pears, apples and cherries, the stock for which was procured from the old Missions, or imported from the Eastern States.

As giving some idea of the adaptability of Butte County to fruit, the following statement from General Bidwell of the output of his orchard in 1891 is given. A very accurate account is kept in this orchard, and the figures are correct. This is the output of 500 acres on the Rancho Chico:

Blackberries	19,626 pounds.
Cherries	145,201 pounds.
Apricots	285,815 pounds.
Quinces	3,172 pounds.
Grapes	521,447 pounds.
Apples	662,209 pounds.
Pears	113,178 pounds.
Almonds	148,044 pounds.
Nectarines	81,783 pounds.
Prunes	377,416 pounds.
Plums	461,542 pounds.
Peaches	2,529,246 pounds.
Total	5,348,679 pounds.

ACREAGE AND VARIETY OF FRUITS IN BUTTE COUNTY.

Variety.	Acres in Trees.			
	Bearing.	Non-Bearing.	Total.	Plant of 1892.
Apple	204	103	307	27
Apricot	310	230	540	112
Cherry	80	85	165	20
Fig	60	199	259	110
Olive	55	700	755	187
Peach	1,180	2,106	3,286	873
Prune	300	731	1,031	258
Pear	200	713	913	210
Plum	51	170	221	62
Lemon	5	15	20	3
Orange	500	2,164	2,664	525
Mixed orchards	100	109	209	27
Nuts—Almond	560	1,028	1,588	320
Walnut	5	7	12	2
Chestnut		10	10	2
Raisins	394		394	
Table grapes	293		293	
Small fruits	18		18	
Totals	4,315	8,370	12,685	2,738

CALAVERAS COUNTY.

Calaveras County is located almost directly east from San Francisco, from which it is distant about 130 miles. It is bounded on the north by Amador, east by Alpine, south and southeasterly by Tuolumne, and on the west by San Joaquin and Stanislaus Counties. It is triangular in shape, its longest sides being 54 miles in length, and its base, resting upon San Joaquin and Stanislaus, being 32 miles across. It has an area of 971 miles, or 668,000 acres.

The topography of the county may be described as an aggregation of rolling hills and small valleys. Many of these valleys continue up into the adjoining hills, which at places become mountainous in size. The hills are usually covered with a growth of oak or pine timber, sparsely scattered over the land where unimproved.

Along the whole northern boundary of the county the Mokelumne River runs, and tributary to this is the South Fork of the Mokelumne, with its numerous branches. Extending along the southern boundary is the Stanislaus River, tributary to which, in the county, are Mill, Coyote, Six-Mile, Angels, Black, and Rock Creeks. Extending through the county midway between the boundary streams is the Calaveras River, with its tributaries, the Jesus Maria River, San Antone Creek,

Middle Fork, and South Fork. These streams and their branches are tapped at various points, and their waters distributed through 525 miles of ditches to various parts of the county. Many springs are also found in the foothill region.

From the peculiar formation and location of the county, the climate is remarkable and widely varied. Divided climatically, the western, or valley portion, with an average width of 10 miles, has an average mean annual temperature of from 60° to 68°. The foothill section adjoining, to a width of 32 miles, has an average temperature of from 44° to 52°. Some snow falls in that portion of the county. The coldest weather recorded within the limits of the county was in June, 1888, when the whole State was visited by the nearest approach to a genuine blizzard that was ever experienced in the history of California. At that time, at Mokelumne Hill, San Andreas, Valley Springs, Copperopolis, Burson, Wallace, and Jenny Lind, in Calaveras County, it averaged 22° above zero. In the most severe cold spell recorded since 1814 the mercury in the middle belt of the county fell to zero. From May until October the county is without storms. From October to May frequent and abundant rains fall. The summers are similar to all the inland counties of California. The thermometer may linger about 100° at mid-day, but the nights are invariably cool and refreshing, and fully compensate for the heat of the day. There is an absence of fogs and chilling winds.

The rainfall in Calaveras County is usually ample to insure crops. A record kept by H. Turner, at Valley Springs, showed a total of 13.90 inches for the season of 1887-8, 14.56 for 1888-9, and 33.15 for 1889-90. This total increased with the altitude until the snow-line was reached. The snowfall is always heavy, and insures an ample supply of water for the streams through the summer months.

There are a variety of soils in the county, each variety possessing desirable qualities. All of the soil, however, is impregnated to a greater or less extent with granite, slate, and limestone particles. Limestone abounds throughout the county, and the rains percolating these limestone hills, dissolve its particles, only to mix them with other soil lower down. The higher mountains of this county are composed principally of gigantic boulders and ledges of granite. From the effects of the weather, snow, frost, and rain, these exposed particles are disintegrated, and the fine sand is constantly being washed down to enrich the soil of the lower foothills. The lower foothills are a succession of strata of slate formation. This slate is generally very soft, and disintegrates and breaks up easily. It will then be seen that the foothill soil is composed chiefly of granite, slate, and limestone. Mixed with these soils are at times gravel, clay, gypsum, and other deposits. It not infrequently happens that on one 80-acre farm every one of these varieties of soil is to be found. To the northeastern part of the county is a granite soil; following this comes the red loam of the foothills; then the sandy, alluvial soil of the plains; next the black sandy loam of the bottom lands. In the granite belt the more hardy fruits, the apple, pear, and plum, with the vine, thrive, while on the red, loamy hillsides is found excellent land for fruit and vine culture. The plains are largely given to grain. The rich river-bottoms grow, without irrigation, fruits of all descriptions, together with large tracts of corn and melons.

The loamy hillsides of the foothill section are tinged a dull red by

the ferruginous ocher which abounds. Many fruits require such soil in order to be produced to their greatest perfection. This soil is adapted to irrigation; it is loose enough to receive water without baking, while the drainage is perfect. The river-bottom lands are easily cultivated and require no irrigation, as the ground is always moist. The sandy, alluvial soil of the plains is strong and deep; fruit grows well without irrigation on these soils, but requires thorough cultivation, that the moisture ascending by capillary attraction may be arrested by the loose soil of the surface, which may be said to act as a mulch.

On the southeast portion of the county the Union Water Company's 90 miles of ditches take 10,000 inches of water from the North Fork of the Stanislaus River at a point about 8 miles from the extreme eastern boundary. In addition, their reservoirs hold in store an amount of water sufficient to supply 500 inches a day for twelve months. This water is distributed through the district around Big Trees, Murphys, Vallecitos, Douglas Flat, Angels Camp, Altaville, and thence to Copperopolis. Joining the Union Water Company's ditch on the north is the Table Mountain Ditch, taking 500 inches of water from the San Antone Creek and conveying it to Sheep Ranch. Also the Ide Ditch, covering 25 miles of country as it flows to El Dorado, Cave City, Old Gulch, San Andreas, and vicinity. The South and Middle Forks of the Mokelumne River cover the country between Railroad Flat and West Point. The Middle Fork carries an average of 1,000 inches. The Blue Lakes, with a capacity of 10,000,000,000 gallons, empty into the South Fork of the Mokelumne River, while the North Fork of the Mokelumne River has a natural site for a reservoir that can be made to hold 800,000,000 gallons of water, an amount which is more than sufficient to supply the wants of Oakland and San Francisco. This system was once surveyed and thought to be feasible for that purpose.

The Clark Ditch takes its water from the South Fork of the Mokelumne, near the Calaveras Big Trees. It extends thence westerly over a belt of country about 32 miles long. This system can be extended to cover all the county lying below in the northwestern corner. Joining this system on the extreme north is the West Point Ditch, taking 400 inches of water from the Middle Fork of the Mokelumne River, at a point 6 miles east of West Point, and conveying it thence to West Point and vicinity.

Following the Clark Ditch into the valleys is the Mokelumne and Campo Seco Canal and Water Company's ditches. One ditch takes 1,000 inches of water from the South Fork of the Mokelumne River $2\frac{1}{2}$ miles northeast from Glencoe. Their reservoir near Railroad Flat gives, in addition, a daily supply of 200 inches of water for the three months. This extensive canal system covers and supplies Mokelumne Hill, Gwin Mine, Campo Seco, Valley Springs, Burson, Wallace, and Comanche.

The Salt Spring Valley reservoir, formerly the source of supply for the North Hill Mine, near Milton, furnishes another considerable source of supply, from which water may be obtained for irrigating purposes.

The Lancha Plana and Poverty Bar Ditch, which takes its water from the main branch of the Mokelumne River at Italian Bar, after passing out of the Calaveras, leads into the counties of Amador and San Joaquin, reaching a point in the last named county within 14 miles of Stockton. While these ditches are principally used for mining pur-

poses, they serve to show what can be done by a system of intelligently conducted irrigation works, supplied from storage reservoirs, for which numerous sites can be found in the county, and to supply which there is abundant water.

The assessed valuation of the waterworks and canals of Calaveras County is given herewith:

Name.	Assessed Value.
Lancha Plana and Poverty Bar Water Co.....	\$5,000 00
Union Water Co.....	50,500 00
Mokelumne and Camp Seco Canal Co.....	50,000 00
Hurley Mining Company's Ditch.....	3,000 00
W. V. Clark's Ditch.....	6,000 00
California Company's Ditch and Reservoir.....	25,000 00
Georgia Ditch.....	250 00
San Antone Ditch.....	1,500 00
Pope's Ditch.....	500 00
Table Mountain Ditch.....	3,000 00
Old Gulch Ditch.....	1,000 00
Total.....	\$145,750 00

Calaveras produces a long line of fruits, both citrus and deciduous. It is not as a horticultural county that Calaveras is known, as its energies have, heretofore, been more directed to mining and agriculture, excelling in hay, grain, and potatoes. Of late years, however, a great deal of attention has been given to fruit growing, and with excellent results.

In the citrus belt, which embraces the northwestern end of the county, the orange, lemon, citron, and olive are found thriving in places with great luxuriance. Citrus fruits have not been grown extensively up to the present date, but when tried they seem to be a success. At Campo Seco orange trees can be seen which are thirty years old, and continue to bear remunerative crops annually. Mr. James, near the Reservoir, has also thrifty orange trees, some of which are of the second generation, having been grown from the seed of the ones first planted, some thirty years ago. This second lot has been bearing for a number of years, and yields fine, marketable fruit. At Jenny Lind, Poverty Bar, Robinsons Ferry, San Andreas, and other points, oranges mature well. At Mokelumne Hill, at an elevation of some 1,300 feet, oranges have been tried, and do well. At the Citrus Fair held in Sacramento City in 1886, Mr. Suesdorff, of Mokelumne Hill, exhibited a branch containing a cluster of forty oranges, which took the first prize as the best cluster. The first trees planted in the county were seedlings, and therefore the fruit is not so large as the improved varieties, but is of a delicious flavor. Of late years the better varieties have been selected, and some of them are coming into bearing. Mrs. O'Neal, of Valley Springs, and Mr. Suesdorf, of Mokelumne Hill, have some young trees of the Washington Navel variety, which are fruiting. Some orange trees are also growing at the Wheat place, on the San Andreas road, and one large lemon tree there has been in bearing for a number of years.

Olives do equally well, and a large number of trees have been planted of late years. Mr. Littlehale has trees in bearing which yield well. H. H. Moore has quite an extensive olive orchard, and Mr. Madden, J.

M. Lemon, H. Turner, and others have small orchards, all of which are reported as doing well.

In the eastern part of the county, where the rainfall is greater and the summers cooler, very fine apples are grown. This district is known as the apple belt, and large crops are annually produced, selling at good prices.

Other deciduous fruits do equally well, and the peach attains a very large size and flavor. Pears grow to an immense size. Apricots and plums grow to great perfection; nectarines thrive well; prunes are prolific, large in size, and dry with little shrinkage. In over one half the county the fig crop is certain and abundant every year, and that, too, without care or cultivation beyond merely planting the slip where the future tree may find depth of soil and sub-earth moisture sufficient to sustain its rapid growth and the development of its delicious fruit. The large blue fig is at home in damp localities, and thrives most luxuriantly when growing in ground that has been placer-mined over, by which the long, penetrating roots are enabled to reach moisture at a considerable depth. The adaptability of this county to growing this fruit bears out fully the report of the State Horticultural Society, through its committee on fig culture, stating that in their judgment the foothill district of this State was best adapted to the growth of figs.

For nut-bearing trees Calaveras seems to have congenial surroundings. In Vallecitos and Douglas Flat, and in many other portions of the county, the English walnut and almond grow thriftily and bear abundantly. Almonds are being extensively planted and are hardy growers. They stand neglect better than other trees, and will grow in some soils, by the assistance of assiduous cultivation, without irrigation. The almond is an article of large importation to the United States; very little, if any, of the Atlantic Coast is suited for its culture, therefore there is but little danger of overproduction. The season for harvesting this nut may be made long if desirable. The trees are free from pests, and finally they will flourish and produce good crops on soils which are too dry to grow good peaches, or similar pulp fruit. For these reasons the almond is sure to become one of the staple productions of Calaveras, as at other points on the coast. The scale bugs do not seem to prosper here in the warm, dry climate, and are seldom found. When found they are easily driven away by the usual remedies.

The crop outlook for the present season is not so good as usual; a late frost, coming when the trees were in bloom, killed off a large portion of the crop. At Mokelumne Hill peaches will give but one fifth of a crop, apples one half, plums one half, prunes two thirds, and apricots one half. The same proportions will hold good in most parts of the county. In some of the more favored localities less damage was done, and the returns will be larger, but over the whole county it is safe to estimate that there will not be over half a crop.

Much of the fruit grown is dried and sacked, in which shape it finds a ready market at Stockton. The green fruit is shipped in 50-pound boxes to Stockton, Sacramento, and San Francisco. The greater part of the green fruit shipped consists of apples, the lack of railroad facilities and long distances over which it is necessary to transport fruit in wagons rendering the shipment of other varieties unprofitable. Last season Stephen M. Hughes, of Mokelumne Hill, shipped 42 tons of apples to Stockton; 85 tons were shipped from West Point, and of assorted

fruits San Andreas shipped 10 tons, Jenny Lind, 10 tons, and Wallace and Burson, 12 tons. Add to this shipments from other points and those made by individuals not engaged in the shipment of fruits, and the total export of fruit from Calaveras would foot up to nearly 200 tons for 1891.

The pioneer orchard of Calaveras was planted in 1855 at Glencoe, by J. Woodcock, who planted a lot of seed obtained from dried apples imported from the East. The orchard is now owned by the son of the original owner, and the trees are bearing still.

Small fruits do well, and many people have a small patch of blackberries, raspberries, and strawberries for home consumption, but none are grown for export.

The principal fruit sections of Calaveras are Campo Seco, Jenny Lind, Mokelumne Hill, Burson, Murphys, Vallecitos, Robinsons Ferry, and Douglas. Of these sections Murphys, which is located in the more elevated portion of the county, is celebrated for the superior quality of apples, which grow remarkably large and possess good keeping qualities. In the lower portions all classes of deciduous fruits thrive. At Burson, Mr. Moore has an orchard of three hundred olive trees planted three years since, which are growing very thriftily and promise early returns to their owner. On the Cuttler place, at the same location, are several large orange trees and two very large English walnut trees, which bear heavily. An English walnut orchard is owned by Mrs. Batten at Vallecitos, which yields good returns. Burson is on the line of the San Joaquin and Sierra Nevada Railroad, and a very large area has been set to new fruit in its vicinity, East rail transportation having given an impetus to the industry.

ACREAGE AND VARIETY OF FRUITS IN CALAVERAS COUNTY.

Variety.	Acres in Trees.			
	Bearing.	Non-Bearing.	Total.	Plant of 1892.
Apple	172	18	190	3
Apricot	20	33	53	7
Cherry	12	7	19	3
Fig	18	8	26	1
Olive	15	105	120	50
Peach	146	194	340	85
Prune	8	61	69	23
Pear	85	25	110	12
Plum	30	20	50	3
Quince	1	1	1	1
Orange	1	14	15	9
Nuts—Almond	30	59	89	31
Walnut	12	11	23	5
Raisins	23	—	23	—
Table grapes	154	—	154	—
Small fruits	64	—	64	—
Totals	791	555	1,346	232

COLUSA COUNTY.

Colusa County comprises a large portion of the great Sacramento Valley. It is bounded on the north by Glenn, south by Yolo, east by Sutter, and west by Lake. The southeast corner, on the Sacramento

River, is 40 miles in a right line over Sacramento City. A line due north from San Francisco runs a little west of the center of the county. The county is 30 miles from north to south, and will average in the neighborhood of 40 miles from east to west.

Of the 2,800 square miles, or 1,800,000 acres, in the county, some 1,500 square miles lie in the Sacramento Valley proper. As the summit of the Coast Range forms the western boundary, the balance of the county is mountains, low hills, and small valleys. The valley portion of this balance is estimated at 200 square miles, and the low, arable hills at 700 to 800 square miles. This is a vast extent of fertile lands. The mountain and hill ranges run north and south. Through the entire length of the county there is a series of ranges of hills running parallel with the coast mountains; between these are small, narrow valleys. Stony Creek heads within 20 miles of the south line, and a low divide separates its waters from those of Cache Creek. Stony Creek runs north, along the base of the mountains, to the north line of Glenn County, where it breaks through the most eastern of the ranges mentioned above, and flows southeasterly across the valley to the river, entering it some 7 miles below the north line of Glenn County. The smaller creeks that rise to the east of Stony Creek break through, one after another, the several other small ranges, and find their way into the "trough" mentioned hereafter. Stony Creek is the last stream that enters the Sacramento River from the west. There are several other streams almost as large that head in the Coast Range, and flow through Yolo and Solano Counties into the tule basin, the same as the smaller streams we have noted above.

The whole of the Sacramento Valley was once either an inland lake or an arm of the bay of San Francisco. The wash from the mountains encroached year by year on the water and made the valley. The deposits that came from the Sierra on the east, and the Coast Range on the west, made the waters from the north keep a middle ground, and hence the Sacramento River runs down near the middle of the valley. Above the mouth of Stony Creek the deposits from the hills on either side have made a regular slope down to the river; but below that point, the valley being much wider, the river banks have grown much faster than the valley at the ends of the small creeks, and the consequence is that the river runs on a ridge, and the streams, which only run in wet winters, from the hills below empty into the trough thus formed. The overflow from the river also flows into this trough. This is on the west side. On the east side we have Butte Creek running on a lower plane than the river, and the overflow of the river gets back into it, while it is lost in the tule basin of Sutter County, which it is not our province to describe here. On the west side the head of the "trough" is some 6 or 7 miles below the mouth of Stony Creek; but it is still some miles below that before any streams make into it from the river. The farther south, the more water in the trough and the wider it gets, until, near the lower end of the county, we have a tule basin. The average width of the trough and basin in Colusa County would be, perhaps, $2\frac{1}{2}$ by 40 miles.

The county lies in the Sacramento Valley, the greater portion being to the west of the river of that name. The county is divided into the Sacramento Valley portion, the foothills, and the higher range valleys and their bordering foothills. The western mountain portion rises to

an elevation of 8,000 feet, and is covered with growths of pine, spruce, and cedar, the most of which is unentered government land.

From Williams, 150 miles to the north, Mount Shasta may be seen rearing its white-capped peak, apparently directly from the plains, like a gigantic pile of snow. To the northeast the Lassen Buttes appear like two grim sentinels guarding the valley; and far in the southeast the Marysville Buttes rise majestically from the plains.

The climate of the whole of the Sacramento Valley proper is substantially the same from the city of Sacramento to the central part of Colusa County, with this material difference: along the banks of the river, where bordered by timber, as it is for miles above and below Colusa, the temperature in summer is much lower than on the plains and in the foothills devoid of timber. The climate of some parts is very nearly perfection itself, and in the lower parts of the county the summers are warm. There are frosts in winter. Owing to the dryness of the atmosphere, and to the nights being cool and refreshing, even the heated terms of summer are not found oppressive. It may be said that almost any desired climate may be found in this county. In the valleys and foothills it is quite hot and dry during three months, the thermometer sometimes reaching as high as 110° for several days at a time, followed by cooler spells. However, nine months of most delightful weather follow the heated term. In the valley and foothills the rainfall begins generally in September, and continues at intervals until May. During the rainy season the weather is delightful—soft, balmy days like the spring of the Eastern States. The climate of the Coast Range Mountains, forming the west boundary of Colusa, is one of the finest and most healthful in the world. One can there get the altitude, find cold mountain water, and have the breeze fresh from the ocean; and by going up or down the mountain side, can find the precise temperature that will suit him.

The following table, compiled from the observations of a series of years, will show the average temperature of the different seasons, at the most prominent points in Colusa County:

	Princeton.	Williams.	Willows.	Orland.	College City.
Average winter temperature	48.2	47.5	45.7	52.6	48.4
Average spring temperature	61.4	61.7	63.0	65.1	63.3
Average summer temperature	78.7	79.6	81.5	81.7	76.6
Average fall temperature	63.3	63.6	64.5	67.6	60.9
Average yearly temperature	62.8	63.1	63.7	66.8	62.3
Highest temperature	114	114	112	113	114
Lowest temperature	19	19	19	22	19
Average rainfall, inches	15.25	12.09	12.03	16.36	16.35

The monthly precipitation in Colusa is given below, from records covering a period of ten years:

	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Colusa	3.73	3.20	2.07	1.39	.51	.39	.40	.20	.16	1.01	1.45	3.25
Orland	1.95	.93	2.90	2.23	1.15	1.24	.00	.00	.20	1.73	1.45	.47
Princeton	3.24	2.24	1.90	1.40	.63	.48	.11	.30	.15	1.14	1.44	2.18
Williams	2.83	1.77	1.55	1.37	.53	.43	.00	.00	.16	1.01	.82	1.69
Willows	2.09	1.32	1.69	1.81	.55	.16	.00	.10	.16	.54	1.06	2.31

Generally the soil is very fertile, but presents a much varied character. Along the river, the borders of the foothills, and in the many small valleys, it is a loose, rich, sandy loam, easily cultivated, retaining moisture wonderfully, and of exceeding fertility. In some portions of the valley proper, it is an adobe, a light or heavy clayey soil, which produces excellent crops when once under proper cultivation. The soil of the foothills is rich and mellow, is easily worked, and possesses every element and condition for the heaviest production of fruits of every variety known to the temperate and semi-tropical countries. The valley land is all alluvial, and so naturally adapted to the culture of cereals that Colusa has for years been the banner wheat county of the United States.

The soil of Northern California is of remarkable fertility. In the valleys of the Sacramento it was formed at the bottom of an immense lake, which received the washings and weatherings from the lofty ranges that surrounded it. For untold ages the potash from the decomposing granite formation, the magnesia and lime from the weatherings of the magnesian-lime strata, and the soda from the decomposed vegetation, were carried, year after year, and deposited in the bottom of this inland sea, where they were stored up in inexhaustible quantities for the use of the tillers of the land in later times.

Nature, not yet satisfied with what she had done for this, her favorite spot, after this great lake had become a thing of the past, continued her work of augmentation by washing from the hills and mountain sides, all streams, great and small, aiding in the work by carrying their deposits of sediment on to the level lands. The heavier material, when thrown over the banks by overflow, was soon deposited, while the lighter material was carried farther from the stream. Thus each stream made a varied soil.

The soil made by the Sacramento River is a light vegetable mold, mixed more or less with clay and sand. On this, vegetation in a state of nature grew much ranker than on the heavy soils made by shorter washes from the hills. The soil of the hills, and even of the mountains of the Coast Range, on the west side of the valley, is all good. Bunch grass, poison oak, and other vegetation, never seen upon poor land, grow there, and hence the little valleys among the hills, as well as the great valley, have good soil. The difference in the soils, then, was made by the settling of heavier or lighter deposits in different places. As the creeks came down the hills throwing up ridges, they would sometimes hem in, as it were, a tract of land so that it could not have sufficient drainage. This became cold and hard, and we called it alkali. The percentage of this kind of land is not great, and it is found that drainage, cultivation, and irrigation redeem it. The soil of the territory overflowed by reason of being in the trough, or basin, is also good, and most of it is farmed with success. On some of it as much as seventy-four bushels of wheat have been grown to the acre. As the soil of the hills is good, and as the greater portion of the area of the hills is susceptible of cultivation, there is but little waste land in Colusa County. Almost every quarter section on the great plains has now been brought under cultivation, and has yielded a profit; and the young man who reads this will see almost every acre of the hills of Colusa County covered with the vine, the fig, or some of the many and varied fruits, to the cultivation of which they have already been proved suitable.

While there are many places in Colusa County where irrigation is not required for growing any form of vegetation, over the greater portion of it irrigation is a necessity for the growth of any but cereal crops. To accomplish this the Central Irrigation District was organized in November, 1887, being one of the first to take advantage of the Wright law. This district is situated in the Sacramento Valley, upon the west side of the Sacramento River. Its upper or northernmost end is about 10 miles to the northeast of Willows (now the county seat of Glenn County). It extends southward from that point for nearly 40 miles, and it has an average width of between 6 and 7 miles. It includes within its limits the towns of Maxwell and Williams, and skirts the town of Willows. The district lies just to the west of the west side depression of the Sacramento Valley, in a region where the eye can barely detect any unevenness of the ground's surface, where soils are deep alluvium, and where nature has granted an average annual rainfall (which ordinarily falls between December 1st and May 1st) of 15 inches.

The Sacramento River, which is at high stages in the spring of the year, and remains at moderately high stages until August, and which does not fall to its lowest stages until late in autumn, is the source of water supply for the Central Irrigation District. The head of the district canal will be upon the west bank of Sacramento River, at a point near the extreme northern line of Colusa (now Glenn) County. The canal will cross Stony Creek at St. Johns, and will thence flow in a southwesterly direction past Willows, where it will cross the Northern Railway. Its general direction after reaching a position about three miles west of the railroad is southerly, until it is west of Williams, thence it is southeasterly to its termination at Cortina Creek. It will be cut to a grade line falling one foot in ten thousand. Its course throughout is in heavy soils, and the loss of water in transit to the lands of the district will be small. The canal will carry water 6 feet deep when full. It will be 96 feet wide between the levee centers, 84 feet wide on the water surface when full, 60 feet wide on the bottom, and its capacity will be 750 cubic feet per second (37,500 miner's inches).

These dimensions will be maintained for a distance of over 20 miles, to near Willows, where the water-surface width of the canal is first reduced to 79, and soon after to 74 feet. As the canal continues on its course along the western line of the district, its width is gradually reduced until it reaches the extreme southern district line with a water-surface width of 49 feet and a bed width of 25 feet. Water will be diverted from the Sacramento River without a dam, the canal being cut sufficiently deep to permit a free inflow of water. This inflow will be controlled by means of a massive headgate, to be constructed of brick, laid in cement. At 6 miles below its head the canal will cross Stony Creek at St. Johns. Its water will be conducted under the creek-bed in seven large wooden tubes. The inlet and outlet of this conduit will be constructed of brick, laid in cement. Throughout the entire course of the canal structures for the control of the elevation of the canal water, for the passage of drainage water across the line of the canal, for the distribution of water, and for canal crossings will, be provided.

At Willows the canal will cross the Northern Railway, and approaching the western edge of the valley lands will hold a southerly course to Cortina Creek, about 5 miles south of Williams. The entire length of the canal will be 60 miles, all across smooth-surfaced valley lands.

Contracts for the construction of 55 miles of the canal have been let, and 30 miles of this work have been satisfactorily completed. Including the work done to June 1st, 1,580,000 cubic yards of earth have been excavated by the six contractors or contracting firms now engaged on this work, at a total cost of \$209,800. The only structures in place at the present time are bridges, of which fifteen have been completed. Contracts have also been awarded for the construction of the headgate and the crossing of Stony Creek. In addition to the contracts already awarded, there are contracts to the amount of \$30,000 yet to be let to insure the completion and equipment of 55 miles of the canal, with check wires, inlet gates, outlets, culverts, creek flumes, and works for the crossing of small Coast Range waterways. The canal will be further extended as the necessary rights of way are acquired.

The main canal skirts the western or highest edge of the district, which is generally less than 4 miles wide, and, with its completion, water will be immediately available to nearly all parts of the district through a distributing system of natural waterways, crossed at short intervals by the main canal, and all to be provided with headgates.

The lands of this district, as has already been stated, are smooth-surfaced, and their slope is away from the canal toward the eastern boundary of the district, which lies near the bottom of the depression in the west-side plain of the Sacramento Valley.

Near the canal the fall of the land toward the east or southeast is generally about ten feet per mile. It decreases to five feet and even less as the eastern edge of the district is approached.

The exceptional smoothness of the surface of the ground which prevails in this district will facilitate the manipulation of the water. The cost of preparing lands for irrigation will be relatively small. The extension of irrigation to all parts of the district will be rapid.

The quality of soils throughout Central District, which has a length of 38 miles, by an average breadth of 6 miles, and which contains 165,500 acres of land, must necessarily be varied. As a whole it is good. Some can be ranked with the choicest in the State, and none will be found too poor to raise alfalfa when water is brought to it under control.

The range of productions in the same area is not surpassed by any other country on earth. Here all the products of the temperate and northern tropical belts meet and grow side by side to perfection. All through this region the pine and palm, the olive and apple, the orange and pear, the pomegranate and the plum, stand in the same orchard and do equally well. In this climate, and on these soils, all the nut-bearing trees attain to large size, and are prolific bearers. The mulberry, upon which the silkworm feeds, finds a congenial home in these valleys. Nature has made this the one spot where all the productions of two zones meet on common ground. Wheat, that food-plant peculiarly adapted to cold climates, and the orange from the semi-tropical zone, grow in the same field in the Sacramento Valley. The whole range of the productions of the temperate and semi-tropical climates, the equals in quantity and quality of those of any other place in the world, can be grown in Colusa County.

From wheat growing Colusa is rapidly passing to fruit growing, and in the past few years orchards have been planted by the hundreds of acres. Prunes appear to be the favorite fruit, and they do remarkably well. Peaches come next, and pears and apricots third. Considerable

attention, however, has been given to citrus fruits in the past few years, and wherever they have been judiciously planted and properly cultivated, they have done well.

Fruit growing in Colusa is of very recent date, not preceding 1884-5, but in the short time that has elapsed since its introduction, it has made very rapid strides. Acres upon acres of orchard and vineyard are being added all around to those planted during the last three years. The experimental stage is past, and these industries will be pushed forward with the utmost activity. The local demand for raisin-grape vines alone has exceeded all sources of supply by more than 100,000. So with many varieties of fruit trees has the demand far exceeded the supply. Fruits of all kinds thrive remarkably in the rich river soils. The raisin grape especially flourishes, for Colusa County, it must be remembered, lies in the same latitude as the famous raisin regions of Spain. The dry, warm climate here presents all the conditions necessary for the production of a choice raisin. The soil of the Sacramento Valley generally is well adapted to the growth of a fine quality of grape. There is much land in the valley of Stony Creek, in Colusa County, that is not surpassed in the world for raisin grapes.

Not only is the county adapted to the vine and raisin, but during the past and several preceding years grapes, apricots, prunes, plums, pears, peaches, nectarines, cherries, apples, walnuts, figs, olives, lemons, and oranges have been extensively planted. A good deal of attention has also been given to small fruits and berries. About three fourths of the county is adapted to general agriculture, the remainder being mountainous, bearing some good timber and suitable, when subdued, for stock raising and the growth of hardy fruits. Colusa supports a drying and packing establishment, which put up a pack of over 4,300 cases last season. This establishment, known as the Colusa Canning, Drying, and Packing Company, was organized April, 1889, with a capital stock of \$30,000, divided into three hundred shares of a par value of \$100 each. Its pack for 1891 comprised 4,300 cases of assorted fruit, gave employment during the season to one hundred people, and paid out \$22,181, as follows:

Paid for wages.....	\$5,551 00
Paid for fruit.....	7,953 00
Other items.....	8,677 00
Total.....	\$22,181 00

The principal fruits grown in Colusa are prunes, peaches, and apricots. These find a market in the East, Sacramento, and San Francisco, and are shipped green, dried, and canned. Apricots and prunes are dried and packed in sacks, the green fruit is shipped in boxes and crates. The value of the output of fruit from Colusa in 1891 was about \$23,000, and the shipments of dried fruits were:

Apricots.....	50 tons.
Prunes.....	75 tons.
Pears.....	3 tons.
Peaches.....	30 tons.
Nectarines.....	3 tons.
Almonds.....	7 tons.
Total.....	168 tons.

Prices for fruit, both green and dried, ruled low, and were as follows:

	Green.	Dried.
Peaches.....	$\frac{3}{4}$ to 1 cent.	$4\frac{1}{2}$ to 5 cents.
Apricots.....	$\frac{3}{4}$ to 1 cent.	8 cents.
Prunes.....	$\frac{3}{8}$ to 1 cent.	5 to 6 cents.

The fruit crop of Colusa the present season was light, but the increase in prices over last year fully compensated for the shortage, and the growers will do better out of their orchards than they did in 1891. In the orchard this season peaches sold for $1\frac{1}{2}$ cents, apricots 2 cents, and prunes at $1\frac{1}{2}$ to $1\frac{3}{4}$ cents on the tree.

There has been a very large area of new land planted to fruit this year in Colusa County, nearly one half of the orchards having been planted during the spring of 1892. A comparison of the acreage in bearing and non-bearing trees will show how rapidly Colusa is changing from a wheat to a fruit-growing county:

ACREAGE AND VARIETY OF FRUITS IN COLUSA COUNTY.

Variety.	Acres in Trees.			Plant of 1892.
	Bearing.	Non-Bearing.	Total.	
Apple.....	6	3	9	2
Apricot.....	156	124	280	16
Cherry.....	8	11	19	2
Fig.....	21	5	26	11
Olive.....	2	8	10	2
Peach.....	43	186	229	21
Prune.....	167	637	804	28
Pear.....	100	179	279	22
Lemon.....	$\frac{1}{2}$	1	$1\frac{1}{2}$	1
Orange.....	1	8	9	1
Nuts—Almond.....	30	16	46	6
Walnut.....	20	40	60	10
Raisins.....	216		216	
Table grapes.....	160		160	
Total.....	930 $\frac{1}{2}$	1,218	2,148 $\frac{1}{2}$	122

CONTRA COSTA COUNTY.

Contra Costa County is one of the central counties of California, its shore-line being within 14 miles of San Francisco. It possesses unusually good traveling facilities, both by rail and steamer, which fact is proven by its boundaries, which are, on the north, the San Joaquin River, which separates it from Sacramento County; on the east, Old River, separating it from San Joaquin County; on the north, San Pablo Bay, Suisun Bay, and the straits of Carquinez; south and west, by San Francisco Bay and Alameda County. Its superficial area is 734 square miles, or 489,760 acres. Nearly half of this is cultivated, the remainder being grazing and waste land.

Across the county, extending in a southeasterly direction, parallel with the coast, the second great and distinct range of mountains forms a natural dividing line between the eastern and western sections. The

distinguishing feature of this range is Mount Diablo, standing out boldly, 3,896 feet in height, towering above all the other peaks, and being very nearly in the geographical center of the county. The great central valley is the Ygnacio, extending from Suisun Bay southward to the base of Mount Diablo, 10 to 12 miles in length and 6 miles in width. Out of this branches Clayton Valley, 10 miles long. The San Ramon Valley is 10 miles in length, by from 1 to 6 miles in width. Besides these are smaller valleys, settled by thrifty and prosperous farmers. The farming lands in the eastern section of the county are between the foothills and the San Joaquin River. They are 23 miles in length, by from 3 to 6 in width, and embrace about 60,000 acres of arable land. The soil is, generally speaking, of a rich, alluvial nature, and produces wheat, barley, alfalfa, fruit, and vines. To the northward, and between the uplands and the San Joaquin River, is a body of tule lands, embracing, in all, some 50,000 acres.

The climatic effects, due to its topography and position, can very easily be traced. Its situation, lying as it does between the Golden Gate and the great San Joaquin Valley, gives it a medium climate, equally free from the fogs of the ocean and from the intense heat of the interior of California. Its mean annual temperature is 52° to 60° , except in the extreme eastern portion, where it is 60° to 68° . Its western range of hills protect it from the cold winds that sweep in from the Pacific during the summer months, while the interior bays serve to modify the heat of the summer sun. The winter frosts are light and of short duration; roses, geraniums and other plants bloom throughout the winter season.

The average annual rainfall is about 18 inches. There is ample precipitation for all purposes of agriculture, and during the past twenty-five years but two seasons have been known when there was a shortage; these were 1870-1, when but 7.01 inches fell, and 1876-7, when there was 7.99 inches. The heaviest season of rainfall in the same period was in 1867-8, when the rainfall was 30.93 inches.

In a report on the soils of Contra Costa County, based on samples taken from the Ygnacio Valley, Professor Hilgard says:

"This specimen represents the prominent soil features which lie around the landward northern and western base of Mount Diablo, bordered by outlying spurs of the Contra Costa range. Beyond and around is an uninterrupted body of splendid farming land. Mount Diablo Creek, heading on the mountain itself, drains the eastern portion, joining Walnut Creek just before its entrance into the tules of Suisun Bay, where the united streams assume the name of Pacheco Creek.

"The plains are dotted with large white oaks, which are especially thick near the borders of the streams. Close to the latter we generally find streaks of heavy, black, loamy earth; but farther away the soils are mostly lighter, both in color and texture, and more or less intermingled with gravel. Sometimes 'gravel ridges' of greater or less width indicate the course of ancient channels, and gravel evidently underlies a considerable portion of the plains, facilitating drainage. This is the more important, as the prevalent character of the soil is that of clay loams.

"Regarding the soil specimen under examination, while it is taken to the depth of 20 inches, wells dug in the neighborhood show no change

of tint to the depth of 60 feet, showing an enormous accumulation of an evidently alluvial soil-mass.

"The sample sent is a brownish-gray loam, which, on wetting, softens quickly and without change of tint. The coarse portion consists mostly of flattened particles of hard shale and quartz, well rounded on the edges.

"The analysis of this soil resulted as follows:

Coarse materials	10.75	
Fine earth	80.25	
Insoluble matter	63.279	72.12
Soluble silica	8.842	
Potash	.77	
Soda	.57	
Lime	1.69	
Magnesia	2.36	
Br. oxide of manganese	.17	
Peroxide of iron	4.91	
Alumina	12.86	
Phosphoric acid	.06	
Sulphuric acid	.01	
Carbonic acid	00.00	
Water and organic matter	5.03	
Total	100.55	
Humus	1.073	
Available inorganic	.898	
Available phosphoric acid	.056	
Hygroscopic moisture	9.056	

"Chemically the soil shows a large supply of potash and of lime, and, as regards the latter, there can be no doubt that it is a general characteristic of the soils of Contra Costa County, since lime is abundant in the rocks on the flanks of Mount Diablo, as well as on the Contra Costa range. On the banks of Walnut Creek, the lower portion of the black loamy earth, just above the gravel that underlies at some 5 feet depth, is full of white gravel or lime concretions.

"The proportion of phosphoric acid in any case would be accounted above deficiency. But the determination of its solubility shows (under the head of 'available phosphoric acid') that practically all of it is in the available state. The soil has a good supply of humus, and therefore of nitrogen. Its power of absorbing moisture is high, and, with its depth, constitutes a safeguard of drought and hot winds.

"Its fruit product cannot fail to be both abundant in quantity and high in quality, and its best general adaptation would seem to lie in the direction of pears, apricots, and grapes."

The above analysis and description of soil relates particularly to the Ygnacio Valley, but the soils of the connecting valleys of Alhambra, Diablo, or Clayton, San Ramon, Briones, and Lafayette, are so similar in character, being the alluvial deposits of the same range of hills, that this analysis fairly represents all the above-named valleys.

The following analysis of soil from Burgundy, France, where is produced the most famous wines in the world, shows a wonderful similarity to that of Contra Costa:

Coarse material	9.75
Fine earth	81.25
Insoluble matter and soluble silica	78.21
Peroxide of iron	5.25
Magnesia	3.98
Alumina	7.47
Organic substances	5.39

In depth, the soil generally throughout the county shows a remarkably continuity of rich alluvial deposits underlaid with limestone or clay. There is an occasional change to a kind of coarse sandy and gravelly heavy loam, of black or brown tint. It has great power for enduring drought, is easy to work, giving large returns with careful culture. Trees and vines seem almost to laugh in their growth as they push their roots down into this fat soil. The soil in the uplands is similar in character to that of the lowlands, and being drier, is for some purposes even better.

The farming lands in the eastern section of the county extend from Bay Point, a spur east of Mount Diablo, between the foothills and the San Joaquin River, to the county line, being 23 miles in length by from 3 to 6 in width, and embrace about 60,000 acres of arable land. The soil is, generally speaking, of a rich alluvial nature, and produces wheat, barley, alfalfa, fruit, and vines. To the northward, and between the uplands and the San Joaquin River, is a body of tule lands, embracing, in all, some 50,000 acres. Large sums have been expended in reclaiming these lands, which become marvelously productive, the soil being a rich deposit of sediment and decomposed vegetation. Thousands of acres are leased to Chinamen and Italian gardeners, who supply the San Francisco market with vegetables and small fruits.

In common with nearly all the coast counties, irrigation is not required in Contra Costa to insure crops. The abundant winter rainfall, the absence of the intense evaporating heat of the interior, and the moisture-laden breezes from the ocean, furnish abundant moisture for all forms of vegetable life without recourse to artificial irrigation.

The tourist, passing through the many beautiful valleys and over the rolling hills throughout Contra Costa County, is impressed with its similarity and general characteristics to the gentle slopes of sunny France. Scattered in all directions are numerous small vineyards and orchards that, with but little cultivation, produce the richest results. Beyond and around the northern and western base of Mount Diablo is an uninterrupted body of splendid farming land. There are plains dotted with white oaks, streams bordered with cottonwood and willows. The wild-oat hill lands, when exposed to the south, are nowhere equaled in the State for olive culture; and there is fruit land all over the county, and no irrigation is required. Among the numerous kinds produced, each embracing all of the superior varieties, are the pear, plum, prune, apricot, cherry, peach, quince, fig, apple, nectarine, pomegranate, olive, persimmon, orange, lemon, lime, date, strawberry, raspberry, gooseberry, blackberry, currant; and among nuts, the pecan, filbert, almond, walnut, and chestnut. Over 6,000 acres of land are devoted to these fruits in Contra Costa, and wherever fruit growing has been tried it has proven successful and remunerative.

The grape growers of Contra Costa state it is a fact that the phylloxera finds no lodgment in their vineyards. Of these there are at present 4,450 acres, of which 3,000 are wine grapes, the varieties of vines successfully growing ranging from Johannisberg Riesling, to the Black d'Ischid, and from the Petit Bouschet to the Golden Chasselas.

There has been a very large increase in the acreage of fruit in Contra Costa County the present year, amounting to about 25 per cent. The possibilities of fruit growing have but lately made themselves known,

and a very large portion of the orchards in Contra Costa are not yet in bearing, and of those yielding fruit very few are yet in full bearing.

ACREAGE AND VARIETY OF FRUITS IN CONTRA COSTA COUNTY.

Variety.	Acres in Trees.			
	Bearing.	Non-Bearing.	Total.	Plant of 1892.
Apple	78	36	114	13
Apricot	235	152	387	37
Cherry	133	73	206	38
Pig	24	15	39	20
Olive		160	160	145
Peach	214	213	427	109
Prune	338	316	654	83
Pear	304	295	599	48
Quince	41	37	78	21
Persimmon	2		2	
Lemon	2	1	3	1
Orange	4	3	7	2
Nuts—Almond	253	224	477	216
Walnut		50	50	8
Other nuts	10		10	
Raisins	216		216	
Table grapes	425		425	
Small fruits	68		68	
Totals	2,347	1,575	3,922	741

This would give about 2,700 acres in trees. Besides this there are 4,486 acres in grapes, as follows:

	Acres.
For table	425
For raisins	216
For wine	3,845

It will be seen from the above that prunes and pears are the leading fruits of this county, while close upon them come almonds. The superior fitness of the soils of Contra Costa for almonds has been demonstrated, and Judge Pope, of Danville, has one orchard of 150 acres planted to this nut. Olives also do well, and Mr. Busby, at Concord, has an olive orchard of 80 acres. Other fruits do equally well, and are gradually changing the face of Contra Costa from a wheat field to an orchard.

The greater part of the fruit product of this county is marketed green, being boxed and crated. Pears and apples are packed in 40-pound boxes; peaches, apricots, plums, etc., in 20-pound boxes, and cherries in 10-pound boxes. These are shipped principally to San Francisco, although a large portion of the fruit product of the county finds its way to Oregon, Washington, and the East. Prices ranged at from 1 to 3 cents per pound. The present season's outlook is good. The crop will not reach the usual average, many varieties being short, but the prevailing prices will nearly compensate for any shortage in the crop.

The principal fruit sections of Contra Costa are Walnut Creek, the region from San Ramon Valley to Martinez, Lafayette, Orinda Park, and Diablo Valley. The prevailing soil in all these sections is a sandy loam, rich in vegetable mold.

DEL NORTE COUNTY.

Del Norte County lies in the northwesterly corner of California, and is bounded on the north by Oregon, on the east by Siskiyou, on the south by Humboldt, and on the west by the Pacific Ocean. It has an area of 1,546 square miles, or 989,000 acres. The eastern portion of the county is mountainous, but in the southern and western parts there is much good agricultural and grazing land. The area suitable to cultivation is confined to the Smith River Valley and a belt along the ocean near Crescent City. A large portion of this county is covered by vast redwood forests, and these extend in an almost unbroken belt from the southern boundary to the Oregon line on the north, with an average width of 40 miles. This land when cleared is very fertile, but the labor of removing the immense redwood stumps and clearing off the partly decomposed logs which cumber the ground is so great as to preclude effort in that direction.

The entire area is practically a succession of mountain ranges broken into narrow valleys. That portion of the Coast Range which traverses the eastern part reaches an altitude of 5,000 to 6,000 feet. Snow remains on the summit of these mountains until late in the summer, and they are rugged and precipitous in the extreme.

Del Norte has an ocean frontage of about 35 miles. The Klamath River is a large stream. The greater part of its course is through this county, which it leaves on the southern boundary entering Humboldt, then reenters Del Norte and empties into the Pacific. Smith River is also a stream of considerable magnitude. Besides these there are a large number of creeks tributary to them, making of Del Norte one of the best watered counties of California.

Del Norte lies within the moist belt, and the precipitation here is much heavier than in most of the counties of California. The rainfall at Crescent City in 1891 was 81.50 inches, and records kept for a number of years show the following monthly averages at the principal points in the county:

	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Camp Lincoln	16.87	6.68	11.20	7.16	0.92	2.17	0.25	0.03	0.30	1.82	9.48	15.58
Crescent City	16.54	9.91	7.53	10.39	3.38	0.96	0.26	0.02	2.06	10.98	4.95	14.13
Fort Terwah.	7.81	10.52	5.00	6.07	3.63	0.62	1.94	0.47	3.05	7.43	8.67	13.01

The soil in the valleys and foothills of Del Norte is very fertile, that of the valleys being devoted chiefly to dairying, which is here the principal industry. In the foothills some excellent fruit is grown, but in limited quantities, and principally for home consumption. An occasional orchard of apples, pears, and peaches proves that the soil and climate here are well adapted to horticulture, and gives promise of the extension of this branch of industry whenever easy means of reaching the markets shall be had. In Smith River Valley some very excellent apples are produced, and pears, plums, and cherries thrive here as well as in any part of California.

The chief industries of the county are dairying, lumbering, and to some extent mining, and comparatively little land is under cultivation. The average being but 7 acres to the square mile.

Of fruits grown here apples form the staple, and these do well, possessing good keeping qualities and being finely flavored.

ACREAGE AND VARIETY OF FRUITS IN DEL NORTE COUNTY.

Variety.	Acres in Trees.			Plant of 1892.
	Bearing.	Non-Bearing.	Total.	
Apple	98	27	125	10
Apricot	$\frac{1}{2}$	$\frac{1}{2}$	1	1
Peach	4	3	7	1
Prune	2		2	
Pear	5	2	7	1
Plum	4	4	8	2
Totals	113 $\frac{1}{2}$	36 $\frac{1}{2}$	150	14

While Del Norte produces a large quantity of apples, the bulk of her product is consumed locally, but a small portion of it finding an outside market, and this finds its way to San Francisco.

The soil and climate of Del Norte seem especially adapted to the growth of apples. The former is generally a deep, black loam, very rich and easily worked, and the climate is marked by great humidity, and but little extreme hot weather. While some small family orchards have been bearing in Del Norte for many years past, some have been planted as early as 1850-53, and are still vigorous. Fruit growing as a business has never obtained a foothold in the county.

The fruit crop this year is very poor over the whole county, and in some parts will be almost a failure. At Elk Valley it is lighter than has been known for twenty years.

EL DORADO COUNTY.

El Dorado County lies on the eastern line of the State, and north of the center, and is bounded on the east by the State of Nevada, north by Placer County, west by Sacramento County, and south by Alpine and Amador Counties. It has a length of 75 miles from east to west, and an average breadth from north to south of 35 miles. Its area is 1,890 square miles, or 1,150,000 acres. Within this area are embraced most of the varied beauties and advantages which are to be found in the most favored portions of this highly favored State. Along her western borders stretches a belt of prairie land but slightly elevated above the level of the sea, where in the primitive days waved vast fields of indigenous wild oats, furnishing luxuriant free pasturage to the cattle, sheep, and horses of the pioneers. This wild grain, those most beautiful pastures, have together with freedom of pasturage, largely disappeared before the march of civilization, but wild oats are still quite abundant, and they, with other nutritious grasses, furnish winter sustenance to great herds of cattle and sheep, which, during the summer, are herded on the succulent ranges of the Sierra Nevada summit region. This prairie belt, and the contiguous lower foothill region, are peculiarly adapted to the growth of fruits—the olive, the fig, and the apricot. Thence, by gradual ascent, is reached a stretch of undulating country, rolling hills, and narrow valleys, covered in their native state with white oak timber, or with

groves of manzanita, chaparral, and buckeye. Here is found the gravelly red soil of the foothill region proper, where the choicest fruit of the vine reaches perfection. Here, too, the peach, the plum, and apricot attain a size, color, texture, and lusciousness which give them incontestable rank as among the finest fruits of their kind.

Thence, still by a gradual ascent, is reached the upper foothill region, with an altitude of from 1,500 to 2,500 feet. This region embraces fully two thirds of the territorial area of El Dorado County. Here the county is heavily timbered with black oak, live oak, spruce, hemlock, fir, cedar, and many species of pine, while the banks of the streams are fringed with maple, alder, dogwood, and madrona, and the air made redolent with the perfume of wild nutmeg and bay. Here the cereals produce good, remunerative crops, while potatoes, beets, pumpkins, Indian corn, and all manner of garden vegetables attain perfection, both in size and quality. Clover yields an enormous and perpetual crop. The apple, pear, plum, nectarine, and all orchard products of the temperate zone attain excellent size, color, flavor, and keeping qualities.

Above the foothills rises the mountain or summit region, in whose highest altitude is found perpetual snow. Here the rivers take their rise, the lakes are fed, and the system of canals receive their waters. Here, too, there is a magnificent forest, one of the grandest on the American continent, embracing thousands of acres of majestic sugar-pine trees, measuring 10 to 15 feet across, and rising frequently to a height of 120 to 150 feet before a limb is reached.

The climate of El Dorado varies with its physical features. In the western portion the summers are hot, the thermometer having a range of 95° to 110°. The nights, however, are usually cool. The winters are characterized with the usual rainy days, interspersed with warm and pleasant weather, and with occasional frosty nights. In the vicinity of Placerville and Georgetown there are sometimes light falls of snow, seldom exceeding a few inches, and rarely remaining on the ground over twenty-four hours. In the eastern portion, the more elevated, including the higher foothills and the mountains, the summers are not so hot and the winters much more severe, with heavy snowfalls and sharp frosts.

From a series of observations covering a period of ten years, kept at Georgetown and Placerville, the following averages are given:

	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Georgetown ..	11.090	8.520	8.776	7.201	2.290	.814	.059	.001	.457	3.465	6.185	9.937
Placerville ..	7.098	6.051	5.790	7.694	1.879	.841	.000	.004	.708	2.186	3.749	8.668

It will be seen from this that the rainy season extends from October to May, and in many seasons little if any rain falls in either of those two months.

Like most of the foothill counties, the soil in El Dorado varies from the black alluvium in the lower regions to the gravelly red soil of the foothills. The lower levels have been filled with the diluvial detritus of the mountains. Occasional streaks of adobe are found. In the mountains are numerous little valleys, the soil of which is formed from the wash of the surrounding hills. The various soils are usually very rich, their fertility being evinced by the large returns from both cereal and pomological crops.

The California Water and Mining Company owns and controls a system of canals, comprising over 250 miles in length, covering every portion of the Georgetown Divide from Loon Lake, 40 miles east of Georgetown by wagon road, to Wild Goose Flat, a point on the American River nearly opposite Loomis, Placer County, and from Chile Bar, on the South Fork of the American, distant only 3 miles from Placerville, to Spanish Dry Diggings, on the Middle Fork. The principal source of water supply is a series of groups of lakes lying on the summit of the Sierra, at an altitude of 6,000 feet, fed by melting snows. In addition, the company takes water from the South Fork and Pilot Creek, both branches of the Middle Fork of the American; also from Rock Creek, Rock Cañon, etc. This county, generally, may claim to be among the best irrigated in the State. The waters have all been appropriated, subject to well defined and settled rules of legal regulation, for public use and beneficial purposes. Conflicts of interests on the irrigation question are not dreaded.

Besides the California Water Company on the Georgetown Divide, there is the El Dorado Water and Deep Gravel Mining Company, and the Park Canal and Mining Company, respectively, on the two other distinct main ridges running east and west, as means of supply.

Following is a list of the water companies of El Dorado County, with the miles of canals owned by them and their assessed valuation:

Name.	Miles.	Value.
Plymouth Consolidated Gold Mining Co.—main branch	35	\$150,000 00
Plymouth Consolidated Gold Mining Co.—branches		4,500 00
California Water and Mining Co.—main canal	30	21,000 00
California Water and Mining Co.—branches	211	9,740 00
El Dorado Water and Deep Gravel Mining Co.	30	30,000 00
El Dorado Water and Deep Gravel Mining Co.—branches	54	28,000 00
National Water and Mining Co.	7	1,400 00
Sundry minor ditches, mining		15,000 00
Sundry minor ditches, irrigating		9,845 00
Total		\$269,485 00

From the above table it will be seen that the greater part of the canals built in El Dorado County have been constructed for mining purposes. El Dorado, in the early part of our existence as a State, was the leading mining county. It was here that gold was first discovered, and the prospects of enormous returns in gold for the outlay led to the building of very costly waterworks. As gold mining has declined and horticulture has advanced these canals have found a new use, and to-day are of as much importance for irrigating purposes as for mining, for they are still used in the latter industry. While this is true, however, horticulture is growing so rapidly while mining is declining, that the growing importance of these water systems is in the direction of horticulture, and they may be classed as irrigating canals.

El Dorado County is very rapidly changing her character from a mining to a horticultural county, and some of the finest fruits in the State are produced here. Her variations in altitude, rising from the Sacramento plain 40 feet above sea-level to the high Sierra region, with an elevation of 8,000 to 10,000 feet, with the accompanying variation in climate from almost perpetual summer to perpetual winter, makes

possible the culture of the widest range of fruits, and most of them flourish in El Dorado County. The peach is the favorite, and following come the Bartlett pears, prunes, cherries, and other deciduous fruits. Apples do well in the higher altitudes up to 3,000 feet, and at Grizzly Flat, Mendon, and other points north on the range, very excellent fruit of the more hardy varieties are grown. In the lower foothills peaches, prunes, and the stone fruits generally prevail, and while little attention is paid to the small fruits, berries and currants, these fruits grow well and bear heavily wherever cultivated.

The principal fruit section of El Dorado is Coloma, where over one half of the entire output of the county is produced. Following come Placerville, chiefly in pears and apples; Granite Hill and Mud Springs, peaches, plums, and pears; Grizzly Flat, Mendon, and Sportsman's Halt, apples.

ACREAGE AND VARIETY OF FRUITS IN EL DORADO COUNTY.

Variety.	Acres in Trees.			
	Bearing.	Non-Bearing.	Total.	Plant of 1892.
Apple	248	7	255	11
Apricot	16	13	29	4
Cherry	29	10	39	1
Fig	14	10	24	
Olive	3	13	16	1
Peach	1,153	185	1,338	103
Prune	202	77	279	27
Pear	36	160	196	
Plum	32	9	41	7
Lemon	1	3	4	2
Orange	4	2	6	3
Nuts—Almond	13	8	21	7
Walnut	3	5	8	3
Raisins	79		79	
Table grapes	190		190	
Totals	2,023	502	2,525	169

Experiments made with citrus fruits, especially the more hardy Japanese varieties, and with the olive, have been very successful, and, like the other foothill counties, El Dorado gives promise of some day making her mark in the culture of the olive, which fruit seems to do wonderfully well here.

The largest single body of land in fruit in the county is that owned by the El Dorado Fruit Company, at Diamond Springs, who have 400 acres of fruit in one orchard, chiefly peaches.

The crop of the present season has been short, ranging as follows:

Peaches	$\frac{3}{4}$ crop.	Pears	$\frac{2}{3}$ crop.
Cherries	$\frac{3}{4}$ crop.	Prunes	$\frac{1}{4}$ crop.
Plums	$\frac{1}{2}$ crop.	Apples	$\frac{2}{3}$ crop.

There are two packing houses located at Placerville—one a branch of Cook, Langley & Co., established this season, the other a branch of Barnett Bros., established in 1891. They are handling a very large quantity of fruit, and keep from twenty to thirty people employed. Barnett Bros. shipped 40 cars of green fruit from here last season, and

it is estimated that the two houses will ship this year over 100 carloads of green fruit from El Dorado County.

The prices paid at the packing houses this season were:

Peaches per 20-lb. box.....	50c. to 60c.
Bartlett pears per 40-lb. box.....	\$1 30
Plums per 25-lb. box.....	75c. to 80c.

These prices were for acceptable fruit delivered at the packing house. The larger part of the fruit grown here is marketed green, being shipped principally to the East in refrigerator cars. Some little fruit finds its way to San Francisco, and some, from 15 to 20 per cent of the total, is dried and sacked. This is dried by the individual growers, and finds its way to Stockton and Sacramento.

FRESNO COUNTY.

Fresno County is one of the largest counties in the State, its area being 8,093 square miles, or 5,600,000 acres. It is located in the heart of the San Joaquin Valley, and is bounded on the north by Merced and Mariposa, on the west by San Benito and Monterey, on the south by Tulare, and on the east by Mono and Inyo Counties. On its eastern boundary line is the summit of the Sierra Nevada, and on the west the crown of the Coast Range, a distance of 140 miles. On its southern boundary runs Kings River, from which it extends north about 60 miles, comprising within itself all the elements of a great State, not only of superficial area, but of natural resources. In no equal area upon the earth, outside of California, can the same physical conditions be found, ranging, as it does, from the field of never-dying snow and ice on the summits of the Sierra Nevada, to the perennial summer of the beautiful and prolific valley 15,000 feet below, so perfectly sheltered by the two ranges that form its eastern and western boundaries. Here it is but a step from the palms to the glaciers, from the Tropics to the Arctic Circle, so far as change of climate is concerned.

Of the vast area comprised in Fresno County, the central part is a great valley 60 miles square, containing nearly 2,500,000 acres of nearly level land. The foothill and mountain section on the east of the valley is about 45 miles wide, and that on the west of the valley about 20 miles in width. The mountains which form the boundary of the valley on the east and the west comprise considerable barren territory. The main valley, however, has a rich soil, varying greatly in quality, consisting of red land, adobe, white ash, dark, sandy loam, and granite.

The valley was once a treeless waste, save along the watercourses, but the decomposed granite or detritus brought down from the mountains in ages past enriched the soil, and irrigation and cultivation have changed the original appearance, and transformed it into the richest fruit and orchard land. In this great central basin, then, there are over 3,000,000 acres. Of this not more than one third is under cultivation, and one half of this only as pasturage or for grain. The soil of this basin is almost uniformly a rich sandy or alluvial loam, quite porous, and usually highly impregnated with phosphates and vegetable mold. In some portions considerable alkali is found in patches, but these are neither extensive in comparison with the vast area of fertile land, nor numerous.

The climate of Fresno differs little from the other parts of the San

Joaquin Valley. The general climatic conditions are favorable to industrial pursuits, there being but few days in the year when outdoor labors may not be prosecuted. The snow belt is far above the valley, and while the effects of a vigorous winter are never felt, there is still enough of cold to give a bracing reaction to the system.

The nutritious fruits and grains of the temperate belt, as well as the rich products of semi-tropical plants, mature here side by side and ripen in due time, and fruits, meats, and grain retain their freshness and sweetness for a season seldom equaled in the extreme heat which at times prevails in midsummer. During the warm season the thermometer frequently goes as high as 100°, and even much higher, but the heat is never oppressive, and one does not suffer as in Eastern States at 80°. This is due to the extreme dryness and purity of the atmosphere—the absence of humidity. Field work is continued throughout the year, people working at harvesting all day in the heat of summer without inconvenience, and no sunstroke has ever occurred in the county. The air is so dry that the perspiration is quickly evaporated, keeping the body cool during the hottest hours of the day. The nights are always cool.

The rainy season begins in November and ends in April. This season is very much like April and May in the East, showers rarely extending over three days.

Following is the mean monthly temperature, as furnished by the Signal Service Officer, together with the minimum and maximum registrations for the same period, the elevation of the thermometer being 77.5 feet above the ground:

TEMPERATURE AT FRESNO, FOR THE TWELVE MONTHS ENDING MAY, 1892.

Date.	Maximum.	Minimum.	Mean.
1891—June.....	112	50	73.0
July.....	114	51	83.6
August.....	112	56	83.6
September.....	104	51	74.6
October.....	94	40	67.0
November.....	81	34	56.2
December.....	66	27	43.9
1892—January.....	69	30	48.5
February.....	70	34	53.2
March.....	78	36	55.6
April.....	80	36	57.6
May.....	100	41	73.0
1891.....	114	26	63.0
1890.....	111	24	62.6
1889.....	112	27	64.3
1888.....	111	20	64.4

The following table gives the rainfall for the season of 1891-92, by months, in comparison with the total for previous years:

Date.	Total Amount.	Greatest Amount in any 24 Consecutive Hours.	
		Amount.	Date.
1890—December	2.30	1.21	24th.
1891—January .....	.88	.54	5th.
February	2.24	.50	21st.
March .....	.81	.26	1st.
April .....	.49	.29	6th.
May .....	.03	.02	
June .....	.02	.20	
July .....	.00	.00	
August .....	.00	.27	
September .....	.27	.27	
October .....	.00		
November .....	.21		
December	3.99		
1892—January .....	.48		
February	1.00		
March	1.69		
April .....	.79		
May	1.44		
1891	2.25		
1890	9.93		
1889	12.27		
1888	8.76		

The total for the past season, from September to May, inclusive, was 9.87 inches.

Irrigation has been practiced for the past twenty years in Fresno, and there are now 1,000 miles of public irrigating canals in the valley, coursing from east to west in many divergent lines, and covering, or capable of covering, with sufficient water for cultivating, not less than 500,000 acres of land. The great body of this land has been found particularly adapted to orchards and vineyards.

There are four irrigating districts, organized under the Irrigation Act, lying wholly or partly in Fresno County. These are the Madera District, wholly in Fresno, the Alta District, the Sunset District, and the Selma District, all of which lie partly in Fresno and partly in Tulare Counties. Of these a further account is given below.

A special peculiarity of much of the soil of this county is its natural adaptability to sub-irrigation. The underlying water, fifteen years ago, was 40 or 50 feet below the surface. Now, from the result of seepage, it can be reached at from 5 to 15 feet. This sub-irrigation is not stagnant water in the soil; it has its current underground no less than the flow of the ditches on the top, although of course not so rapid, and it thus increases each year, pressing out upon the plains and filling the depth of the soil far in advance of the irrigating canals. This valley has an almost uniform slope, from the foothills to its center, of from 5 to 6 feet to the 100 feet, forming a most perfect trend for waterways. It is this slope also that aids to press the sub-irrigation down into the center of the valley and its broad extent. This gentle, gradual slope answers also another important end. It might be feared that this gradual filling up of the soil from beneath would continually come so near the surface as to make the whole region a vast swamp; but this is prevented by the natural drainage which this slope secures. The

waters of Kings River, brought upon these plains from the foothills of the Sierra, are in a large part in the form of sub-irrigation, pressing through many miles of underground flow, to reach again their old channel in the center of the valley.

IRRIGATION WORKS IN FRESNO COUNTY.

Name.	Miles.	Value.
Fresno Flume and Irrigation Co.	30	\$30,000 00
Enterprise Canal and Irrigation Co.	30	80,000 00
Emigrant Ditch Co.	15	20,000 00
Fresno Canal and Irrigation Co.	200	1,250,000 00
California Pastoral and Irrigating Co.	21	25,000 00
San Joaquin and Kings River Canal Co.	20	40,000 00
Madera Flume and Trading Co.	52½	30,000 00
Totals	368½	\$1,475,000 00

The Fresno Flume and Irrigation Company derives its water from the head of the San Joaquin River. It has now under consideration the construction of a reservoir which will cover 1,200 acres of land and have a storage capacity of 1,338,132,000 cubic feet. When this is completed it will put from 80,000 to 100,000 acres under water. Water rights sell at \$10 per acre, with a yearly rental of \$1 per acre. The work of construction on this reservoir was begun in July of the present year, under the superintendence of C. B. Shaver, and J. M. Graham, engineer.

In addition to the 30 miles of canal owned by the Enterprise Canal and Irrigation Company, it controls many miles of side ditches. Its source of supply is Kings River, from which it takes 100 cubic feet per second. The shares are owned by some thirty stockholders. The Emigrant Ditch Company is composed of twenty shareholders, and the water is divided among them according to the number of shares owned. The company claims a flow of 196 cubic feet per second. A flow of one cubic foot is considered sufficient for 160 acres of land. At this rate, therefore, this company has sufficient water to irrigate 31,360 acres.

The Fresno Canal and Irrigation Company was incorporated February 16, 1871. It diverts from Kings River 1,000 cubic feet of water per second, and covers 160,000 acres of land. This is supplied to the consumer at 62½ cents per acre per annum.

Of late years horticulture has made rapid strides in Fresno County, and is fast becoming the principal industry of the people. Raisin growing has received by far the greater amount of attention, but of late other fruits have forced their way to the front, and are now dividing attention with the favorite fruit, until to-day orchards of all kinds of fruit can be found in the county, and all seem to do well and prove remarkably productive. While it is true that most fruits thrive here, it is also true that some varieties are better adapted to the peculiarities of soil and climate which exist here than are others.

Among the most profitable orchard fruits may be named the peach and nectarine, and the apricot in some localities. These are of very rapid and healthy growth, coming into bearing in the third and fourth years, and with the assistance of the summer climate for sun-drying, give

large returns from the crop. Apricots and peaches both do well. Pears and plums grow and bear well.

The result of prune culture has not been sufficiently promising to regard it as a hopeful industry for the future. There are vast areas of arable lands in the foothills, rich and choice valleys, where almost all orchard fruits that require cool, moist atmosphere can be grown.

Olive culture is yet in its infancy in this county. There are a few trees six or more years old, but these have grown well and bear heavily. Within the last two or three years considerable acreage has been set to this fruit, and the prospect for future success is good.

The same is true of fig culture. The black California fig is an old habitant of this county, and has been a sturdy grower and most prolific bearer. This can be seen in the older foothill towns of the county. Within a few years attention has been somewhat turned to fig culture, and many acres have been set out. So far the result is very promising. The variety most in favor is the White Adriatic. Large shipments have been made, with the most satisfactory results.

Very little attention has as yet been given to the culture of citrus fruits. A few orange orchards in the foothill regions of this county, fifteen or eighteen years of age, show excellent results. The fruit ripens very early. Within the next few years much more attention will be given to orange culture, and immense orchards will be planted in the thermal belt.

The cultivation of the fruits so far referred to may be called only the side issues in Fresno County fruit culture. This valley, under the "reign of water," is remarkably adapted to the culture of grapes of all varieties. Thus the planting of vineyards became the leading industry. At first this was largely confined to the culture of wine grapes, and several of the largest vineyards and wineries in the State have become established. The yearly output of wine and brandy has been, during the last few years, in the region of 2,500,000 to 3,000,000 gallons. The heavy-bearing quality of wine grapes is here phenomenal, reaching in some of the best vineyards 12 to 14 tons to the acre.

But in the planting of vines attention was soon turned to the Muscat, or raising grape. Early experiments proved that the rich, alluvial soil was eminently fitted to the growth of this grape, and that the climate was equally suited to cheap and easy curing of the fruit as those foreign countries which produce the delicious raisins of the world's commerce. This industry had many obstacles to overcome in the beginning; many predictions of failure, and many sneers over the early product. The raisin output was about 4,000 20-pound boxes ten years ago, and it must be confessed was, upon the whole, not an article likely to win renown in competition with the well-established foreign brands. Not a few raisin-grape growers were so discouraged as to contemplate cutting out their Muscat vines. The increase of product has gone forward from 4,000 20-pound boxes in 1882 to a product of more than 1,000,000 boxes in 1891. At the present rate of planting it will only be four or five years until at least between 2,000,000 and 3,000,000 boxes will be put up in the Fresno district.

The Muscat vine is a rank feeder, and finds abundant food in the multitudes of old sloughs and extinct waterways that course through this valley. It loves abundant moisture, even up to the ripening of its fruit; this it finds in the prevailing sub-irrigation, and in many cases

necessity for surface irrigation is obviated. A few of the best vineyards have never had any surface irrigation. This permanent underground moisture to draw from makes it possible to harvest a second crop of grapes, in quantity and quality nearly equal to the first.

California is destined to become a region of specialties, and while every district may be able to raise, with more or less success, all the products of others, every district can raise some one commodity better and with larger profits than any other district.

Fresno County so far, in its history of raisin culture, has been the phenomenon of the Pacific Slope. The magnitude of its possibilities in this line can scarcely be imagined to-day.

Up to the season of 1891 all fruit raised in the county was shipped green or dried. That season the industry of canning was added. The Fresno Canning Company was organized last spring, local fruit growers associating themselves in the concern with the old San Francisco house of A. Lusk & Co.

The season proved a very successful one, despite the fact that the apricot crop was somewhat short in the county.

The total pack for the season amounted to 52,069 cases, each case holding twenty-four cans, making a total of 1,219,658 cans of fruit. The amount of case goods is divided into the following varieties:

Cases of apricots.....	4,315
Cases of Bartlett pears.....	9,210
Cases of peaches.....	31,319
Cases of plums.....	3,110
Cases of grapes.....	4,115

This means the consumption of 115 tons of apricots, 290 tons of Bartlett pears, 1,550 tons of peaches, 70 tons of plums, and 120 tons of grapes, making a total of 2,145 tons, or 4,290,000 pounds of fruit.

The company paid out for fruit alone during the season the sum of.....	\$53,615 09
For labor in preparing the fruit, etc.....	41,034 19
For cases.....	6,100 13
For sugar used in the fruit.....	17,913 10
For cans.....	41,609 81
For coal, solder, labels, etc.....	11,200 00

Making a grand total of..... \$171,472 32

Besides the handling of this immense amount of fruit, the cannery company shipped about 40 cars of green peaches to San Francisco. Financially the company was equally successful. Its pack was not excelled in the State, and has made a great reputation for Fresno fruit all over this country and Europe, the bulk of the output having been shipped to the Old World.

As has been stated, Fresno is essentially a raisin county, and here are produced the greater part of the raisins shipped from the State. Following these in order of importance are peaches, pears, nectarines, apricots, prunes, and plums. These fruits find a market in the East, where they are shipped green or dried. The green fruit is packed in boxes and crates, and the dried in boxes and sacks. A very large part of the raisin crop is now shipped in sacks to the East, where it is boxed by the jobbers.

The yield for the present season is rather below the average. The first crop of raisins was short about 25 per cent, apricots were light, plums and prunes fair, peaches, pears, and nectarines average. The

increased prices of the present season over those paid last year have much more than compensated for the shortage, as will be seen from the following statement of average prices paid last season and this for dried fruits:

	1891.	1892.
Raisins	3½ cents.	4½ cents.
Peaches	6 cents.	12½ to 13 cents.
Pears	5 cents.	8 to 12 cents.
Apricots	5 cents.	12 to 16 cents.

Fresno, Selma, Fowler, and Madera are the principal fruit centers of Fresno County, and the increased acreage of fruit planted this year will exceed 6,000 acres. This is very largely in raisin grapes, although more attention is being given to tree fruit in Fresno at present than ever before.

ACREAGE AND VARIETY OF FRUITS IN FRESNO COUNTY.

Variety.	Acres in Trees.			
	Bearing.	Non-Bearing.	Total.	Plant of 1892.
Apple	38	147	185	96
Apricot	448	112	560	68
Cherry	4	3	7	2
Fig	320	131	451	98
Olive	70	50	120	30
Peach	1,214	844	2,058	615
Nectarine	81	68	159	40
Prune	640	938	1,578	446
Pear	422	212	634	82
Plum	12	13	25	7
Lemon	1	2	3	1
Orange	9	124	133	47
Nuts—Almond	5	21	26	13
Walnut	10	60	70	24
Raisins	35,900	8,000	43,900	5,000
Totals	39,174	10,725	49,899	6,572

GLENN COUNTY.

Glenn County is the youngest in the sisterhood of California counties, having been separated from Colusa by Act of the Legislature of 1891. Its area is 130,000 acres. It is bounded on the south by its parent county, Colusa, on the east by Butte, on the north by Tehama, and on the west by Trinity and Mendocino. It is one of the Sacramento Valley counties, and is located on the eastern slope of the Coast Range, on the western side of the valley, and extends from the summit of the Coast Range to the Sacramento River, these forming its natural eastern and western boundaries.

The eastern portion of the county consists of level valley lands which change into rolling hills on the west, becoming more extensive and precipitous in the foothills of the Coast Range until they merge into the mountains.

Willows, which is the county seat, has a beautiful location in a gentle slope of the Sacramento Valley. No finer view can be presented. With

its productive fields looking toward Mount Shasta to the north, the Sierra to the east, and the foothills of the valley and the Coast Range to the west, a land of loveliness and grandeur is presented to the eye.

What has been said of the climate of Colusa holds good of Glenn, there being but little difference between the two, as will be seen by the table of precipitation at Willows and points in Colusa County published under the latter head.

The soil is generally of a fertile character, and ranges from a rich black loam in the bottom lands along the river to a more gravelly soil in the higher and foothill regions. The rich clay lands of the western foothills has proved itself well adapted to fruit growing, and some excellent results have been obtained. The hills surrounding the small valleys present any variety of surface, and are adapted to the culture of a great variety of vegetable products.

For irrigation purposes Glenn is well supplied with water. On the east is the Sacramento River, with its swift current of clear, crystal water; it runs the whole length of the county from north to south. Stony Creek flows north and then southeasterly into the Sacramento River. This creek has several tributaries, and the water is used for irrigation by a number of settlers. Several irrigation districts have been formed. In the Central District water is diverted from the Sacramento River, near the mouth of Stony Creek, and conveyed in an immense canal southwesterly to Willows. There the canal crosses the railroad and pursues a southerly course along the foothills to a point near Arbuckle, where it will terminate for the present. Another irrigation district will furnish water for 40,000 acres near Orland. A number of streams of smaller size also rise in the foothills and flow into the valley, where they are lost.

Glenn has not as yet attained any great reputation as a fruit county, her great staple industry being the production of wheat. Enough has been done, however, to show that this county is well adapted to the growth of a very long line of horticultural products. Prunes make a rapid growth, bear early and yield heavily; peaches and apricots do equally well. Apples and pears, on soil in locations suited to their requirements, yield abundantly. Citrus fruits also do well where they have been tried, while some of the finest raisins in the State have been grown here. Nuts, also, seem to be a profitable crop, and some very excellent walnuts and almonds are produced here. In the hills and Stony Creek country large areas have been planted to fruit and vines, and with most gratifying results. It will be but a short time before Glenn will take her place among the horticultural counties of the State, and maintain it by the excellence of her products.

The chief fruit products of Glenn are peaches, apricots, and prunes, but of these but little is yet shipped outside of the county, the orchards being yet too young to bear in any great amount. The sections which seem to be best adapted to fruit are Fruto, Orland, Elk Creek, and Princeton. Orland is the citrus section of the county, and some young orange trees planted here have made a very promising growth. At Fruto prunes, peaches, and apricots are the prevailing fruits, and the soil and climate seem especially adapted to their growth.

ACREAGE AND VARIETY OF FRUITS IN GLENN COUNTY.

Variety.	Acres in Trees.			Plant of 1892.
	Bearing.	Non-Bearing.	Total.	
Apple.....	32	77	109	37
Apricot.....	117	110	227	103
Cherry.....	7	16	23	5
Fig.....	13	16	29	3
Olive.....	4	5	9	2
Peach.....	200	186	386	120
Prune.....	50	201	251	92
Pear.....	60	63	123	20
Plum.....	7	3	10	1
Orange.....	12	11	23	7
Nuts—Almond.....	70	118	188	83
Walnut.....	30	50	80	20
Raisins.....	900		900	
Table grapes.....	50		50	
Totals.....	1,552	856	2,408	493

HUMBOLDT COUNTY.

Humboldt County extends from the 40th parallel of latitude, which is its southern limit, to about midway between the 41st and the 42d parallels, where it adjoins Del Norte County, and is with this one exception the most northerly county of California. Its boundaries are Del Norte on the north, Siskiyou on the northeast, Trinity on the east, Mendocino on the south, and the Pacific Ocean on the west, where the sinuosities of the coast-line extend some 175 miles. From north to south the county extends 108 miles, while in width it averages about 40 miles. It contains 3,590 square miles, or 2,297,600 acres of land. A good idea of its size may be had when it is stated that it is over one half the size of Massachusetts, and somewhat less than the State of Connecticut.

This area may be subdivided into the following classes: Timber land, 938,000 acres; agricultural land, 450,000 acres; grazing land, 500,000 acres; marsh land, 31,285 acres; mineral land, 125,000 acres, and unclassified lands, 253,315 acres:

The topographical features of Humboldt are varied and picturesque. The surface is extremely rugged, numerous spurs of the Coast Range intersecting the county in all directions, rising in many places to absolute grandeur.

Besides a number of smaller streams, the county is drained by two rivers of importance. Entering at the extreme northeastern corner, the Klamath traverses it for about 30 miles in a southwesterly direction, and there being joined by the Trinity, flows northwesterly 45 miles, and empties its waters into the Pacific Ocean just north of the county line. Entering the county at its eastern line, the Trinity flows about 30 miles and joins the Klamath, a river carrying a vast volume of water to the ocean. Among the minor streams are Mattole, Bear, Elk, Redwood, Little, and Mad Rivers, and Redwood Creek. Second to the Klamath is Eel River, navigable for small craft, such as scows, flat-boats, and small steamers. All these flow in a northwesterly direction, and are separated from each other by a high hill country.

Of the topography of the Klamath River country, the Humboldt "Standard" gives the following description:

"The Klamath is the second largest river in the State. This stream reverses the physical conditions which characterize the Sacramento. The latter stream takes its rise amidst the alpine surroundings of the Sierra Nevada, flowing from its snowy eyrie with great force and volume. Below Shasta it meanders through valleys of extensive width, great depth of soil, and marvelous fertility to San Pablo Bay; whereas, the Klamath takes its rise amidst a vast expanse of levels, consisting of lakes, swamps, and tules—all this lacustrine region being remarkably fertile when reclaimed—until, entering the rocky embrace to the Coast Range, it rushes on through these defiles tumultuously to the ocean. On the south this condition is again reversed, through its tributary, the Trinity, this river flowing from the rocky defiles almost from the foot of Mount Shasta. If we could be suspended over the river in a balloon, we would find the outline of the stream fan-shaped, with its periphery extended between Shasta County in our State and Lake County in Oregon, 300 miles in width, running down to a point at Weitchpec, using the river from that point to the ocean as a handle. Its tributaries, the Trinity, Salmon, and Scott Rivers, all flowing from the eastward, pour their annual floods into the parent stream, and, owing to the great elevation of their surrounding mountains, which reach a height of 6,000 and 8,000 feet, covered through the winter months to great depths with snow, which, under the hot sun and heated air, pour forth their aqueous tribute till the month of April, when these floods are usually at their height, these annual floods surpassing anything in the State.

"It drains the waters of seven counties: Humboldt, Del Norte, Trinity, Shasta, and Siskiyou, in California, and Jackson and Lake Counties, in Oregon. Its course, from its source, is west-southwest from Klamath Lake, and afterwards southwest, making a sharp bend at Weitchpec, north-northwest to the Pacific Ocean, where it is a mile wide at the mouth. The length of the river proper is about 250 miles; including the large tributaries, about 1,000 miles. It enters the ocean about 41° 30' north latitude, and the estuary can be easily distinguished for many miles at sea. Nowhere in the State can be found such testimony of that ancient geological period when this continent was submerged. This channel has been cut through by the silent and persistent erosion of the waters, until it has acquired a depth of 400 or 500 feet. In many places this channel was miles in width, notably at Orleans Bar, where it must have been many miles."

On the coast the temperature of Humboldt County is uniformly cool and pleasant, ranging from about 56° in the summer, to 45° in the winter. The heat increases after leaving the coast-line, the thermometer ranging from 52° to 100°, according to season. Freezing point is but rarely reached in the valleys during the winter, and it never snows except in the higher valleys and near the heads of streams. Snow falls every winter on the elevations back of the timber belt, and sometimes to the depth of several feet; it seldom lies, however, for more than a week or two at most. It has been said, and truly, that any variety of desirable climate is to be had in the valleys of Humboldt County, on her low, rolling, or high hills, or on her coast. It is warmer in winter and cooler in summer than in the heated valleys of the interior.

Maurice Connell, Observer of the Weather Bureau at Eureka, furnishes the following summary of the temperature and rainfall at his station for the year 1891:

TOTAL RAINFALL BY MONTHS.

	Inches.		Inches.
January	3.33	July	0.29
February	9.81	August	0.31
March	5.83	September	1.45
April	6.37	October	1.64
May	1.55	November	2.72
June	1.53	December	11.45

Annual amount of rainfall for the year 1891, 46.28 inches.

TOTAL DAYS ON WHICH RAIN FELL FOR EACH MONTH OF THE YEAR, 1891.

	No.		No.
January	15	July	4
February	20	August	5
March	16	September	6
April	17	October	11
May	11	November	14
June	10	December	24

MONTHLY MEAN TEMPERATURE, 1891.

January	48.0°	July	56.0°
February	45.4	August	59.4
March	49.0	September	56.7
April	50.9	October	54.1
May	53.2	November	52.1
June	56.0	December	43.9

MONTHLY MEAN DAILY RANGE OF TEMPERATURE FOR 1891.

January	13.2°	July	9.5°
February	11.7	August	9.5
March	10.3	September	11.5
April	12.6	October	13.0
May	9.0	November	11.5
June	10.9	December	9.2

Latest spring frost, April 11th.

Earliest fall frost, October 1st.

ANNUAL RAINFALL FROM 1883 TO 1891, INCLUSIVE.

	Inches.		Inches.		Inches.
1883	27.01	1886	35.46	1889	48.70
1884	30.35	1887	40.17	1890	55.54
1885	42.27	1888	36.48	1891	46.28

The soil of the bottom lands and on the hills next the coast is black; that on the bottom is of a sedimentary composition and somewhat argillaceous, while that on the hills rules more of a sandy loam. The soil on the interior hills is composed of disintegrated rock, mixed with organic matter and decayed vegetation.

The capabilities of Humboldt County as a fruit-growing section are very great, and there can be scarcely a doubt that this industry is destined to assume much greater proportions in the future than it has in the past, or than it does at the present time. Until recently, but very little fruit has been sent out of the county, that grown being consumed at home. Nearly every farmer has his own garden and orchard, where he has raised enough for his own use, for that of his neighbors, or for sale to local or adjacent markets. Of late more attention has been paid to the raising of fruit for sale, and the business is liable to expand greatly, as the really excellent quality of the product becomes more widely known. Fruits of most kinds do well, particularly apples, pears, prunes, peaches, cherries, apricots, and berries. Strawberries

and raspberries grow in great abundance, and a small area of land in these fruits, well cultivated, will bring an immense return for the labor expended. In the vicinity of Eureka two crops of strawberries are produced per year, of fine flavor and great size. Raspberries bear from June to September, and even in December and January fine raspberries are found on the bushes grown in the valleys.

The yield of all kinds of fruit is generous, and in many instances prodigious, the limbs of apple, plum, and prune trees literally groaning under the weight of the fruit they often bear. Eel River Valley has, for a long time, been one of the finest sections of the coast for the production of apples. It would seem that the soil had been "made on purpose" to bring forth fruit of the most delicate flavor and juiciness, while the climate, neither too hot nor too cold, has doubtless much to do with the result.

Humboldt County was awarded the first premium for the finest exhibition of apples in 1885 at the Mechanics' Fair Institute, in San Francisco, and again in 1889 and 1890 it carried off the highest honors for its superb apples at the State Fair held in Sacramento. The French, German, and Hungarian prune flourish wherever planted and cared for in this county—in the valleys and on the hills.

In the Klamath River country climate and soil are well adapted to horticultural pursuits. Peaches are grown here as large as a teacup, and of the most luscious flavor. They cannot be carried to any market, as they have to be packed on animals, and, from the tenderness of their flesh, are unable to withstand this rough transit. The grapes grown here are of fine flavor and firm flesh. The varieties for table use are particularly good, and the wine made from the wine grape of good body and flavor.

At Rohnerville there are a number of orchards where excellent fruit is produced, the favorite being apples, which here excel in size, flavor, and keeping qualities. Very large shipments of apples, both green and dried, are made from Rohnerville.

Will B. Barber, local fruit inspector for the Ferndale fruit district, comprising the voting precincts of Ferndale, Grizzly Bluff, and Island, has furnished the following figures, taken from records kept during inspection:

Number of bearing apple trees 8 to 30 years old	8,160
Number of unbearing apple trees 1 to 8 years old	5,120
Number of bearing plum trees, including prunes	1,260
Number of unbearing plum trees, including prunes	675
Number of bearing pear trees	190
Number of bearing cherry trees	285

Total number of fruit trees of all kinds in district

15,690

Lately much attention has been directed to horticulture in this county, and a company, "The Southern Humboldt Orchard and Vineyard Company," with a capital stock of \$32,000, has been organized to prosecute this branch of industry. A tract of 320 acres of land was purchased near the town of Blocksburg, and 40 acres were planted to prunes and 5 acres to apples last spring.

Humboldt County excels in apples, and of these the favorite varieties are Rome Beauty, Lawver, Stark, Wagner, Arkansas Pippin, Ben Davis, and the Bellflower. These find a ready market, to which point they are shipped by steamers. The apple crop of Humboldt, like the

fruit crop of the whole State, was short, not exceeding over half an average crop.

The output of the different varieties of fruit shipped from Humboldt county for 1891 was:

	Pounds.		Pounds.
Apples	740,000	Cherries	16,000
Peaches	60,000	Pears	10,000
Prunes	10,000		
Plums	2,500	Total	838,506

These netted the grower the following prices per pound, green:

Apples	1 cent.	Plums	3 cents.
Peaches	3 cents.	Cherries	5 cents.
Prunes	3 cents.	Pears	3 cents.

The principal fruit sections of the county are Camp Grant, McDarmidt, Rohnerville, Blocksburg, Upper Mattole, Arcata, Bottom, Eel River Valley, Garberville, and Phillipsville. All these sections are adapted to the apple, but peaches, prunes, pears, and many other varieties of deciduous fruits do well, while for berries the conditions seem perfectly adapted. There was a considerable acreage of new land set to fruit this year, but owing to the distance from market there is not the consideration paid to fruit growing in Humboldt County that it deserves.

ACREAGE AND VARIETY OF FRUITS IN HUMBOLDT COUNTY.

Variety.	Acres in Trees.			
	Bearing.	Non-Bearing.	Total.	Plant of 1892.
Apple	600	149	749	57
Apricot	5		5	
Cherry	22		22	
Fig	2		2	
Olive	9		9	
Peach	15		15	
Nectarine	1		1	
Prune	275	176	451	87
Pear	8		8	
Plum	9		9	
Quince	1		1	
Walnut		3	3	2
Table grapes	3		3	
Small fruits	94		94	
Totals	1,044	328	1,372	146

INYO COUNTY.

Inyo County, the third largest county in the State, has an area of 10,156 square miles, or 5,196,000 acres. Its boundaries are the State of Nevada on the east, Mono on the north, Fresno and Tulare on the west, and San Bernardino on the south. The entire territory lies east of the Sierra Nevada Mountains, the summit of which forms the western boundary of the county, extending north and south a distance of 120 miles, with a width of 60 miles.

The topography of Inyo County is more marked than that of any county in the State. Here the Sierra attains its greatest elevation and the valleys their greatest depression. It is a country of rugged and

giant peaks, among which are Mount Abbott, 12,400 feet; Mount King, 14,000 feet; Mount Williamson, 14,500 feet; Mount Tyndall, 14,386 feet; Mount Whitney, 15,000, and Mount Inyo some 15,000 feet, upon which the snow of ages forever rests, and forming a giant wall upon its west, as if to shut it out from all connection with the State of which it forms a part, marked by precipitous and sharp outlines and deep chasms, such as to render an ascent to their summits from their eastern slopes almost an impossibility. A country where, to the eastward of those peaks pointing heavenward, the earth's surface sinks hundreds of feet beneath the level of the sea, as in that valley, once the valley of mystery and fear, known as Death Valley—a country of beautiful and fertile plains and forbidding wastes; a country of almost arctic frosts and torrid heat.

The agricultural portion of Inyo lies along the foot of the great Sierra range, and is in the main comprised in Owens Valley, through which courses Owens River. The valley is about 95 miles in length, with a belt of arable land varying in width from 2 to 8 miles, and lies at an altitude of about 4,000 to 5,000 feet. It contains about 180,000 acres of arable land, rated from fair to good, of which about 40,000 acres are under claim. Something near 15,000 acres are under cultivation, and irrigated mostly from the numerous brooks and creeks that come down from the snowy Sierra.

Wherever water can be procured for irrigation the soil of Inyo has proved to be very fertile, and very large agricultural crops are produced in Owens Valley. In many portions of the county, however, the soil is absolutely sterile, consisting of vast alkali flats, beds of salt, and sandy wastes. The celebrated Death Valley, with its vast borax lakes, is in this county.

The climate of Inyo resembles that of southern Nevada. Occasionally light falls of snow come in the winter, but do not usually remain long on the ground. Frosts are frequent, and in the higher altitudes severe winters are the rule. The annual rainfall is light, averaging at Camp Independence from 6 to 8 inches annually.

Owens River, the chief stream, takes its water from the Sierra, and flowing a distance of 150 miles south is lost in Owens Lake. This river carries a volume of water 50 feet wide; average depth, 6 feet; flow, 5 miles an hour; and the irrigation ditch now partially completed will give 50,000 acres of agricultural land, capable of producing fruits and grains. Water comes running down in creeks from the mountains on the west, and affords a bountiful supply for household and irrigating.

The farming lands of Inyo are not found in the valley of the river proper, but on the numerous small mountain streams flowing down from the Sierra on the west, from which the waters are diverted for the purpose of irrigation.

Fruit growing is not extensively followed in Inyo, and what is produced finds a local market. Some excellent apples are grown here, and with better means of communication a profitable industry could be developed in the growth of this fruit. Peaches, pears, and grapes are also grown, and do well where properly cultivated.

There are a number of farmers in Inyo, all of whom have small orchards and vineyards, ranging from 2 to 5 acres in extent. These usually supply the demand for home consumption, and the surplus finds a market in the mines. The fruit produced here is generally very

excellent in quality, but the location of the county precludes it competing with the fruit counties of the State. Berries and currants do especially well in Inyo, and are very prolific.

ACREAGE AND VARIETY OF FRUITS IN INYO COUNTY.

Variety.	Acres in Trees.			
	Bearing.	Non-Bearing.	Total.	Plant of 1892.
Apple	85	62	147	12
Apricot	11	13	24	7
Cherry	8	6	14	2
Peach	82	28	110	5
Prune	47	25	72	10
Pear	12	26	38	12
Nuts—Almond		2	2	
Walnut	1	3	4	1
Raisins	60		60	
Table grapes	20		20	
Totals	326	165	491	49

Nothing can be accomplished in Inyo County without irrigation, and a number of important irrigating works are established there. The Inyo Canal Company, Mr. F. McIvor, Superintendent, is engaged in a work of much importance to that section of the State. The canal which is now building on the east side of Owens River will be one of the largest works of the kind in the State. Taking water out about 6½ miles north of Independence Station, it will carry it as far as Owens Lake, the entire length of the ditch being 31 miles. In size the ditch is 50 feet wide on the bottom, and will carry 15,000 inches of water. It will cover from 30,000 to 40,000 acres of land, all of which has been entered, and is only waiting for water to be placed under cultivation. At present 1½ miles of the ditch have been completed. Water will be turned on and utilized as fast as sections of the canal are finished.

IRRIGATION WORKS IN INYO COUNTY.

Name.	Miles.	Assessed Value.
Bishop Creek Ditch (irrigating)	8	\$1,600 00
Farmers Ditch (irrigating)	6	700 00
Inyo Canal	30	1,800 00
McNally Ditch	10	1,000 00
Stevens Canal	10	1,500 00
Seeley Canal (incomplete)		1,500 00
Totals	64	\$8,100 00

KERN COUNTY.

Kern County comprises the southern part of the Tulare Basin and the greater part of the semi-circle of mountains which inclose it on all sides except the north. It is bounded on the north by Tulare, on the east by San Bernardino, on the south by Los Angeles and Ventura, and on the west by San Luis Obispo County. Its area embraces 8,100 square miles, or 5,137,920 acres.

About two thirds of the county is covered by hills, mountains, and a portion of the Mohave Desert. The entire width of the Sierra Nevada range is included in this county, where, trending to the westward, it joins the Coast Range, to the summit of which on the west and south the county extends. The remaining third of the county is agricultural land, including all the mountain valleys. These valleys are generally small, excepting that known as the Tehachapi Pass, and that of the South Fork of the Kern River, which may contain an arable and irrigable area of 30 to 40 square miles. These valleys are the most thickly settled portions of the county. They are well watered and fertile, with differing climates, according to altitude. The greater part of the arable land of the county, however, is in that portion of the Tulare Valley formed by the amphitheater of mountains in the Sierra Nevada and Coast Range. The lowest depressions are its lagoons, some 300 feet above sea-level, where its rivers are lost in the plains; from this to the high peaks of the Sierra there is a rise of 10,000 feet. On the eastern side of the Sierra Nevada is the Mohave Desert, a large part of which is included within the boundary of Kern, where at Mohave Station the elevation is 1,751 feet. The Sierra Nevada crosses the county from the north, with a curve to the southwest, in which is Walkers Pass, with an elevation of 5,302 feet, trending eastward; Tehachapi Pass, 3,964 feet, with a southeasterly trend; Tejon Pass, 5,285 feet, and the Cañada de las Uvas, about the same elevation, with a southerly trend. On the western border of the county is the Mount Diablo range, with an elevation of from 2,000 to 3,000 feet. From the junction of the Sierra Nevada and the Coast Range, the San Emigdio Mountains are projected some 20 miles northward into the valley. The greater portion of the arable land of the county lies in the amphitheater thus formed by the Sierra Nevada and the Coast Range. In this area there are over 2,000 square miles, half or more than half of which is upland, bordering on the foothills to the east and south, and to some extent on the west. In the central portion of the valley lies the lagoon, or bottom lands, among the richest in the county. The margins of the valleys are plains, with elevations of from 1,000 to 1,500 feet, rising to the base of the mountains.

This section has a drainage by Buena Vista Slough to Tulare Lake, 35 miles north by west. Formerly the entire valley was a region of desert and marsh, but about seventeen years ago there was commenced a system of reclamation by irrigation and drainage that has made a great portion of the waste land the most productive in the State. By the drainage and the diversion of the water of Kern River the lakes have become nearly dry, and much of their former beds are under cultivation.

Kern River and Poso Creek are the principal streams of the county, Kern being the third in magnitude of the rivers flowing from the Sierra Nevada south of the Sacramento, the two larger being the San Joaquin, flowing to the ocean, and Kings River, flowing to Tulare Lake.

This river rises among the highest peaks of the Sierra Nevada, in the northeastern part of Tulare County, having two large forks flowing southwesterly 100 miles, 35 miles of which are through the grandest cañons of the Sierra. It enters the valley near Bakersfield, then flowing westward divides into many channels, forming an extensive delta known as Kern Island. The river has a catchment area of 2,383 square miles of the high Sierra, giving it a flow as it debouches on the plain of from 2,700 to 20,000 cubic feet per second in the time of floods.

From where Kern River enters the foothills to the head of the irrigation system of Kern County, is about 30 miles. For 20 miles of this distance the flow is through high, sandy, and gravelly banks; the rest of the distance the banks are shallow, and continue so from this point to Buena Vista Lake reservoirs, 25 miles distant.

Poso Creek has its source in many branches high up in the Greenhorn Mountains, the lofty spurs of the Sierra, rising in T. 25 S., R. 30 and 31, flowing southerly some 25 miles, then westerly and northwesterly until it sinks in the Great Valley in T. 25 S., R. 23 E., after a winding course of 75 miles. This stream falls very rapidly out of the mountains, at 200 feet per mile, discharging its waters very quickly and becoming low early in the season. It has a watershed of 468 square miles. Poso Irrigation District has been formed, and a system adopted for impounding the waters of the stream and the construction of retentive canals for the irrigation of the land of the district.

The mean average temperature is higher than in most of the counties of the State, the average temperature of spring being 65°, of summer 85°, of autumn 65°, and of winter 50°, averaging for the year between 66° and 67°. The highest record of temperature is 118°, and the lowest 16°, in the valley. These extremes are rare, especially the lower one. The atmosphere is dry and rarified, and never extremely oppressive. The nights are usually cool. The long, warm season renders possible the production of two crops of grain or vegetables per year, on irrigated land, and is of great advantage to the fruit grower in the drying season. The rainfall is below the average, rarely exceeding 5 inches for the season. For the past four years the precipitation is given as follows:

	Inches.
1887-8	4.15
1888-9	4.58
1889-90	3.50
1890-1	5.16

The meager rainfall, of course, necessitates superior irrigation facilities, and the very heavy precipitation in the mountains, often exceeding 100 inches, makes them possible. The precipitation in the mountains is snow, which is preserved by the high altitudes until midsummer, the time it is most needed on the plains below, when it is discharged through the rivers and creeks in enormous volume.

There are in this county a number of mountain valleys of varying extent and fertility, among the more prominent of which are Poso Flat, Little Poso, and Glenville, or Linville, beautiful parks on Poso Creek in Greenhorn Mountains, a spur of the Sierra Nevada west of Kern River. Havilah is in a deep valley of Clear Creek, a branch of Kern, 35 miles northeast from Bakersfield. Tehachapi Valley extends from near the summit of the Sierra Nevada at Tehachapi Pass, southeast along the valley of Camera Creek into the Mohave Desert, with a length of 8 miles, and ranging in width from a quarter of a mile to a mile. To the southwest are the smaller valleys of the Tejon, Los Uvas, San Emigdio, Zapatero, Pastoria, Casteria, and La Siebia.

The soil of all these valleys varies from sandy loam to heavy adobe, approaching to gravelly in the higher foothills. There is a great deal of the red land (the favorite fruit land) along the foothills. The prevailing soil, however, appears to be a fine sand mixed with loam, and exceedingly fertile when water is applied, but barren without.

Kern is one of the best irrigated counties in the State, and its main canal and lateral ditches have an aggregate length of 650 miles. These are supplied from the Kern River, from which thirty large irrigating canals have been taken. The largest of them is the Calloway Canal, which taps the river 1½ miles northeast of Bakersfield, where the river is 480 feet wide. This canal leads northwesterly a distance of 32 miles, is 80 feet wide on the bottom and 120 feet wide on the top, has banks 7 feet high, and usually flows 6 feet, and has a grade of eight tenths of a foot per mile. It commands an area of 200,000 acres.

Sixty-five distributing ditches, from 8 to 20 feet wide, are taken from it, having an aggregate length of 150 miles.

Kern Island Canal is taken from Kern River about 2½ miles northeast of Bakersfield, and flows through the city. It is 48½ feet wide at the bottom and 4 feet deep. At Bakersfield this canal has a drop of 20 feet, where it furnishes power for a large flouring mill.

It was commenced in 1870, and is one of the oldest of the system of irrigating and water-power canals in Kern County.

E. E. Young, in writing of irrigation in Kern County, describes the system as follows:

"The point in Kern River, which has been selected as the head of the irrigating system, and from which the first canals are taken, is high enough to cover or make irrigable about 600,000 acres of land in this delta. This has a general slope of from 5 to 8 feet to the mile, to the south and west. To the natural eye it appears almost as level as a floor. There are no hills, forest trees, ravines, rocks, or other obstructions to check or divert the water in its downward flow. Nature has done the needful, and man has merely to make the application. This is the secret of the wonderful success of irrigation in Kern County.

"This system was begun in 1875, and was one of the first in California to assume important and scientific proportions. Up to this time the irrigation works of Kern River consisted of a few miles of small ditches conducting water to a few hundred acres of cultivated land, located in the vicinity of Bakersfield. The water was taken from the river direct by ditches, which conveyed it to the land under cultivation. The expense of these ditches and their maintenance soon became too great for the few parties in interest, and after repeated attempts to induce coöperation, the project was abandoned.

"At this point J. B. Haggin and Lloyd Tevis came upon the scene. These men saw at that early date what inestimable gifts nature had bestowed upon Kern County. They knew that the trinity of water, soil, and sunshine would prove the talisman of great wealth in the not distant future. They began the system of irrigation which has since grown to such important proportions.

"They employed the best engineers obtainable to take charge of the work. They spent thousands of dollars in experimenting, and numerous mistakes were made. The subject of irrigation was, at that time, comparatively new in the United States. Numerous self-constituted advisors appeared and predicted failure and bankruptcy for these bold projectors.

"It is, then, to no public legislation or State enactment that Kern County is indebted for her model irrigation system. All credit is due primarily to private enterprise. Singly and alone these men have accomplished the greatest irrigation project of the nineteenth century in America. They have done what is often so hard for financiers to do—

put their own money in the enterprise they represent. In backing their judgment with money they have been successful in this as they have in every other enterprise. Up to date the total expenditure on their irrigation system amounts to \$3,500,000. Improvements and extensions are now under way which will cost another half million, thus bringing the total cost up to \$4,000,000.

"At the point on the river from which the water is distributed throughout the Kern Delta, the banks are low and sandy. This reduces the cost of diversion to the minimum. This same alluvial deposit, composed largely of a rich, sandy formation, obtains throughout the delta, and has greatly reduced the cost of the system. It is estimated that if the river banks were high, or the country rough, or composed in part of hardpan, the irrigation system would have cost 100 per cent more.

"There are twenty-seven main canals in this system. These have an aggregate length of about 300 miles. There are more than 1,100 miles of ditches and laterals fed from these main canals. This does not include the arms of ditches used to convey the water to each 20-acre lot in the colonies."

Following is a list of the canals in Kern Valley, with their size, and the amount of water appropriated:

Name of Canal.	Miles in Length.	Inches of Water.	Cubic Feet Per Second.
<i>North Side of River.</i>			
Beardslee.....	8	47,236	938
McCord.....	14½	5,000	100
Calloway.....	32	74,000	1,476
McCaffrey.....	3	1,296	26
Emery.....	3	2,000	40
Jones & Tuckey.....	4	1,000	20
Wible.....	1	5,040	100
Railroad.....	1	31,075	620
Goose Lake.....	4½	90,000	1,795
Pioneer.....	11½	20,074	400
Edwards.....	2	1,440	29
James & Dixon.....	3	14,000	279
Johnson.....	4	8,640	172
Ashe.....	1	1,200	24
May.....	2	4,000	80
Joice.....	4	6,250	125
Dixon.....	2½	3,450	69
Totals.....	99½	315,701	6,293
<i>South Side of River.</i>			
Kern Island.....	18	20,000	400
Old South Fork.....	3	3,800	75
Farmers.....	19½	14,400	287
Castro.....	5	1,000	20
Stein.....	47½	55,980	1,117
Anderson.....	4	5,057	101
Gates.....	2½	5,057	101
Buena Vista.....	13½	14,000	279
James.....	17½	19,730	394
Plunket.....	3½	5,057	101
Meacham.....	4	1,500	30
Wilson.....	2½	500	10
Henley.....	2½	2,880	57
Traver.....	2½	2,600	52
Kern Valley Water Co.....	40	130,000	2,594
Totals.....	185½	281,561	5,618
Grand totals.....	285½	597,262	11,911

South of Tulare Lake is a large tract known as the artesian belt, in which a large number of flowing wells have been sunk. They range in depth from 200 to 460 feet, penetrating strata of sand, clay, and gravel. The flow of these wells ranges from 1,000,000 to 2,500,000 gallons every twenty-four hours, and it has a uniform temperature of 71° winter and summer. These wells already irrigate very large areas, and this is steadily increasing. The area included in this artesian belt is about 50 miles north and south, with an average width of 15 miles. There are about twenty of these wells near Miramonte, and they vary in depth from 250 to 650 feet, and cost from \$500 to \$4,000 to sink. Their flow varies from 100,000 to 4,000,000 gallons daily.

Buena Vista Lake has been converted into a reservoir by Henry Miller and J. B. Haggin, the work having been commenced in 1888 and concluded this year. It covers 25,000 acres, and has a capacity of 50,000,000,000 gallons. The work cost \$300,000.

Fruits of nearly all varieties do well in Kern County. Peaches, nectarines, apricots, prunes, plums, and cherries all do well, as do apples and pears. In favored localities around the foothill region oranges, lemons, and other members of the citrus family do well. Nuts also, so far as tried, have been very successful, and walnuts, almonds, and pecans grown in Kern are equal to those produced anywhere.

Plums and prunes thrive especially well, the favorite varieties being the Petit Prune d'Agén and the Hungarian.

The more common varieties of apples will hardly repay the producer; but the man who will plant nothing but healthy trees, of the higher-priced varieties, will soon see his way clear to the possession of a tidy little bank account. The varieties most popular in New York, New Jersey, and the New England States are the ones that thrive best here. These include the Newtown Pippin, Red Pearmain, and Spitzenberg among the best keepers, and the Rhode Island Greening, which is the monarch of all the fall ripeners. Those who desire a good apple for cider, and for that indispensable farmers' sauce known as "apple butter," will find a very good one in an apple much grown in the northern portions of New Jersey and Delaware, and known as the Harrison. This is a small, yellow apple, generally esteemed by housewives for cooking purposes, its lack of size being its chief objection, but the tree is a very prolific one, and seldom gives short weight. Another apple from northern Jersey is called the Canfield, or Campfield, and attains a large size.

While most varieties of fruit do well in Kern, the peach seems to do especially well, and it is the favorite fruit; and a local writer says, in regard to its productiveness and profit:

"While peaches of fine quality are produced in nearly every county of the fifty-four that constitute this great State, it is no exaggeration to assert that the orchards of the valley lands of Kern County stand pre-eminent. In earliness of maturity, rapidity and thriftiness of growth, abundant productiveness, and size and flavor of fruit, the peach orchards of this section are absolutely without a peer. That this is no mere unfounded assertion will be proven by a few facts easily susceptible of corroboration, and which may be classed as phenomenal, though not at all exceptional in the region referred to.

"From 15 acres of the George's Cling variety, when the trees had been in orchard but eighteen months, there was harvested a crop of 5 tons of first-class fruit. At the time this fruit was growing, a crop of

potatoes that yielded some \$500 was taken from the ground between the trees. The following year the trees were so burdened with young fruit that it became necessary to remove half to two thirds thereof. The remainder matured magnificently, and from the orchard there were shipped 7,731 boxes of fresh fruit, 3,000 pounds of dried fruit, which sold for a high price, and several hundred boxes of choice specimens that were given away or sold in small quantities. The gross yield of this crop was \$360 an acre, and the entire expense of cultivation and harvesting was a little over \$21, leaving a net return of almost \$340 for each acre.

"Another remarkable instance of success in peach culture is that of a seven-year old (1890) peach orchard of 20 acres—17 in George's Late Cling and 3 in Orange Cling. Unfortunately no record was kept of the actual yield of these trees for the first five years, but the third season after planting there was a fair amount of fruit, while in the fourth and fifth years there were good crops, which sold at \$40 to \$45 per ton. The sixth year the crop was 5,600 boxes of 20 pounds each, and the price obtained was 4½ cents per pound. The seventh (1891) year there were gathered 16,013 boxes of George's Late and 2,500 boxes of Orange Clings, besides which there were over 4 tons of dried fruit. The total receipts were \$13,307, while the entire cost of production was but \$1,300, leaving a net return of \$12,000, or \$600 an acre. Other equally remarkable instances might be cited, did not lack of space forbid, but these will suffice for illustration.

"Not the least remarkable feature of the peaches produced in Kern County is their large size, high color, and fine flavor, coupled with qualities that enable them to be shipped to the Eastern market with little or no loss. Hundreds of boxes were packed last year, in which each peach weighed a pound or more, while frequently specimens were gathered that were from twenty to twenty-three ounces in weight."

The shipments of peaches from Bakersfield in 1891 amounted to 79,500 boxes, and this output will be greatly increased the present season, by reason of the new orchards which are coming into bearing. The chief fruit sections of the county are Bakersfield, Delano, Rosedale, Onyx, Weldon, Kernville, and Glenville, and the prevailing varieties in order of importance are peaches, apricots, plums, prunes, apples, and pears. Besides these there is a very large acreage in raisin grapes, which do equally as well in Kern as in the other southern San Joaquin counties.

In most sections of the county the fruit crop has been greater this season than in most counties of the State. While it is not reported as full, owing to a late spring, which caused a shortage in many parts, the percentage of loss in Kern was much less in this than in most parts of California. A very large area of new land was set to fruit here this season, over 2,000 acres having been planted, the greater part in the vicinity of Bakersfield. Kern is rapidly taking a front place among the fruit counties of the State, and she is especially favored for this purpose in soil and climate. A new irrigation project, alluded to above, is now under way, which will put a very large section of new land under water, and a great many land owners under the system are already making plans for setting out large tracts to orchard the coming season. It is therefore probable that the present season's record will be greatly

exceeded by the next. The high prices paid for fruit this season, too, will give an additional impetus to the work.

ACREAGE AND VARIETY OF FRUITS IN KERN COUNTY.

Variety.	Acres in Trees.			
	Bearing.	Non-Bearing.	Total.	Plant of 1892.
Apple.....	226	112	338	58
Apricot.....	79	221	300	126
Cherry.....	10	15	25	8
Fig.....	56	25	81	5
Olive.....	1	30	31	10
Peach.....	662	417	1,079	128
Prune.....	399	547	946	89
Pear.....	65	250	315	53
Lemon.....	1	2	3	1
Orange.....	8	18	26	5
Nuts—Almond.....	39	128	167	43
Walnut.....	30	41	71	12
Raisins.....	5,600	—	5,600	—
Table grapes.....	210	—	210	—
Totals.....	7,386	1,806	9,192	538

Pears of all kinds do well in this region. The Bartlett pear, which always finds the readier sale and generally brings the better price, is much hardier as a tree and gives the orchardist less anxiety during the earlier stages of its existence. All the later winter pears have thriven in this locality, especially the Easter Beurré, which can be made to attain great size with moderate irrigation. After picking they must be housed in dry and cool cellars and kept until the holidays, and the expense attendant upon this procedure is generally accompanied by prices that compensate for the extra outlay.

LAKE COUNTY.

Lake County, which on account of its scenic beauties, is named the Switzerland of America, lies about 100 miles north of San Francisco. Its boundaries are Napa on the south, Yolo and Colusa on the east, Mendocino and Glenn on the north, and Mendocino and Sonoma on the west. The county is about 75 miles long and 25 miles in width, and lies between two broken ridges of mountains, the Macayamas on the west, and the Coast Range, locally known as the Bear Mountains, on the east. It has an area of 1,078 square miles, or 704,000 acres, of which the larger part is mountain. At the southern extremity is Mount St. Helena, at the northern Mount Hull, while in the center is located Clear Lake, a magnificent body of water 25 miles in length and 6 miles in width. It is from this that the county takes its name. This lake is situated at an elevation above the sea of 1,350 feet; the eastern shore is skirted by high mountains, but not abrupt, while at the center, on the western shore, it is almost divided into two lakes by Mount Konocti, or, as it is commonly known, "Uncle Sam," which rises out of the bosom of the lake to a height of 1,500 feet.

While Lake is a mountainous county, there are, nevertheless, a number of fertile valleys found ensconced among its hills. Some of these are of considerable extent and very fertile. Big Valley, which lies on the

southwest shore of Clear Lake, comprises within its area 2,500 acres of first-class valley land, capable of producing all classes of agricultural and horticultural crops. The valley is well watered by three streams which pass through it, namely, Kelsey Creek, Cold Creek, and Adobe Creek. All of these streams take their rise in the mountains, pass through the valley and empty into the lake. Scott Valley lies along Scott Creek, in the center of the county, west of the lake, and contains about 7,000 acres of very rich land. Contiguous to the valley is also a large area of fine foothill land. Artesian water can be had anywhere in the valley at depths of 80 to 100 feet. Bachelor Valley, which lies north and west of the lake, contains about 3,000 acres of land, and is surrounded by low, open hills. Upper Lake Valley lies at the extreme north end of the lake, and embraces some of the best quality of land, much of which is under cultivation. Lower Lake Valley is at the south end of the lake, and is formed by the junction of Copsey and Seigler Creek Valleys, forming a large and fertile tract. On the foothills surrounding this valley are found the largest and finest vineyards in the county. Coyote Valley, in the southern portion of the county, contains 15,000 to 20,000 acres of fine land, and is formed by the junction of St. Helena and Putah Creeks. On the same creeks lies Loconoma Valley, separated from Coyote Valley only by a low range of hills, and being virtually a continuation of the same. Here are found some of the finest orchards and vineyards in the county. Burns Valley is small, but romantic and productive, and contains some beautiful residences. Cobb Valley is formed by the upper waters of Kelsey Creek, which takes its rise in Cobb Mountain. Besides these there are a number of smaller valleys, including the Capay, Clover, Donovan, Gravelly, High, Irwin, Jericho, Jerusalem, Long, Morgan, Paradise, Rice, The Twin, and others, all containing fertile land, capable of cultivation and heavy production.

The great charm of Lake County is its climate. The winters are never severely cold nor the summers oppressively hot. From November to April much rain usually falls, and ice occasionally forms in some places, but during this period there are days and weeks at a time when the sun shines brightly and the weather is perfectly delightful. Flowers usually bloom all winter, which is a sufficient evidence of mildness.

From May until November the weather is always fine. But little rain falls, and though the summer days are warm they are not often sultry. A gentle breeze nearly always springs up in the afternoon, and though the evenings are sufficiently pleasant for one to sit out of doors until bedtime, the nights are usually cool enough to make a light blanket or quilt comfortable as a bed covering. Fogs are rare, and chilling winds almost unknown.

The following table shows the average precipitation, by months, at Kono Tazee and Middletown:

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Kono Tazee ..	5.13	3.78	4.17	1.04	.50	.48	.00	.00	.17	1.07	3.35	2.26
Middletown ..	7.66	4.48	6.23	7.87	1.35	.72	.00	.00	.80	1.35	3.02	8.67

The valley soil of Lake County in general is a very rich alluvium of great depth and rare fertility. In the hills there is a larger admixture of gravel, but here in many cases the soil is from 10 to 12 feet deep and very retentive of moisture, rendering irrigation unnecessary.

The resources of this county are mostly derived from the crops of wheat, barley, oats, corn, hops, and potatoes; from fruit, from sheep and hogs, and from the pineries and quicksilver mines. Wine making is becoming an important industry, wineries being established at Lower Lake, Middletown, and on the northwest shore of Clear Lake. The best fruit lands are in the foothills. They are well watered, but as there is a sufficient rainfall to insure good crops no irrigation is necessary. All kinds of fruits do exceedingly well, especially the apple, pear, peach, apricot, plum, and prune. The Newtown Pippin apple, prized so much in the Eastern States and exported largely to England, grows to great perfection; pears likewise, the Bartlett pears from Lake County commanding a very high price in the San Francisco market. Lake County, however, is behind her sister counties of California as a fruit producer, but comparatively little attention so far having been paid to this branch of industry. Her soil and climate are well adapted to fruit, and with easier means of communication with the outer world there is little question but that horticulture would soon come into prominence.

The principal fruits grown are apples, pears, and prunes. The market for these is to a great extent local, although a large part of the apple crop finds its way to San Francisco. The output for this season is very light, prunes being reported as an almost total failure, apples but half a crop, and pears about a third. But little planting has been done this year, the difficulty of reaching markets acting as an impediment in the way of extensive planting.

There are a number of old orchards in Lake, one at Kelseyville, of apples and pears, now owned by Mr. McIntyre, being thirty-five years old. The Herrick orchard is the same age.

W. P. Filmer has established an olive orchard of 800 trees, which, although as yet too young to bear, gives great promise for the future, and proves that Lake is suitable for olive growing.

ACREAGE AND VARIETY OF FRUITS IN LAKE COUNTY.

Variety.	Acres in Trees.			
	Bearing.	Non-Bearing.	Total.	Plant of 1892.
Apple	158	70	228	18
Apricot	10	12	22	3
Cherry	9	35	44	9
Fig	12	13	25	3
Olive	1	53	54	10
Peach	140	70	210	20
Prune	160	278	438	73
Pear	54	99	153	25
Orange	1	1	2	—
Nuts—Almond	9	16	25	4
Walnut	15	60	75	20
Raisins	4	—	4	—
Table grapes	450	—	450	—
Totals	1,022	707	1,729	185

There are no irrigation works in Lake, and irrigation is practiced on so small a scale that it may be said to have no existence there. The soil is generally of a pervious character, and holds moisture in sufficient quantity to answer all the requirements of the orchardist.

LASSEN COUNTY.

Lassen County is one of the most northerly counties of California, being separated from Oregon by Modoc County. It lies on the eastern slope of the Sierra Nevada Mountains, and is bounded on the north by Modoc County, on the east by the State of Nevada, on the south by Plumas, and on the west by Shasta County. Its southern boundary is very irregular, running in a southeasterly direction from Shasta to Sierra County, making its eastern boundary on the State of Nevada 105 miles in length, while the western boundary, on Shasta County, is not more than half that extent. Its area is 4,750 square miles, or 3,040,000 acres; of this there are 375,000 acres of valley land, 325,000 acres of foothill land, and the remainder is classed as mountain.

The county is a succession of mountain ranges and valleys, and although in the central and eastern parts the hills seem to have been placed regardless of direction or order, the ranges have a general trend to the southeast and northwest. A ridge having an altitude of 8,200 feet, and called Diamond Mountains, makes the dividing line between Lassen and Plumas Counties. Diamond Mountains form the southern side of Honey Lake Valley, which extends southeast and northwest a distance of 45 miles, with a width of about 15 miles. In the extreme northwest corner of the county lies Big Valley, a large stretch of agricultural land, extending into Modoc County and comprising in Lassen County about 75,000 acres. This valley is watered by Pitt River, Ash Creek, and several smaller streams. Long Valley lies in the extreme southeast of the county, contains for its size but little agricultural land, but is remarkable for its singular conformation. Its south side is a high and very heavily-timbered ridge, while the rise in the north is gradual and the country dry, timberless, and open. The valley is about 40 miles in length but very narrow, having an average breadth of from 1 to 3 miles between Big and Honey Lake Valleys, separated from each other and from the main valley by intervening ridges of various lengths. The last named valleys are very small, containing but few ranches, and are mostly occupied by the bodies of water from which they take their names. In the eastern-central part of Lassen County lie the Madeline Plains, a large level tract of land, and at an altitude of 5,300 feet. This plain appears to have been at one time the bed of a lake, and to have been formed to its present condition by some change of nature. It is about 35 miles long and 15 miles wide, and is covered with a dense growth of sagebrush.

There is a great contrast in the climate in the counties east and west of the Sierra Nevada range. In the northeastern portion of California, the seasons more nearly approach those of the Eastern States, but are not so severe. In Lassen County there are heavy falls of snow in the winter months, and heavy freezes are common.

The air is bracing and tonic, being at no time oppressive. The mercury rarely goes above 85° or 90°, 75° to 80° being the more common midsummer temperature at noon. The nights are always cool, but not affording excessive contrast with the day temperature noticed in portions of California.

The rainy season occurs the same as in San Francisco, the precipitation being about the same on the mountains. The precipitation varies with the altitude and the distance eastward from the Sierra. The Sierra plateau, above described, presents no western arresting wall

against the moisture-laden clouds from the ocean, and the fall of rain and snow is very heavy, especially the latter. According to United States Signal Service maps, the average is nearly double that on the highest mountains of Los Angeles and San Bernardino Counties. This melting snow supplies our irrigating water in Susan River, Willow Creek, Ball's Cañon Creek, and other streams and Eagle Lake, providing permanent and liberal irrigation for a vast area.

As illustrating the climate of Lassen County, T. B. Saunders, Observer at Susanville, forwards the following report for last year:

	Highest Temper- ature.	Lowest Temper- ature.	Mean Temper- ature.	Rain.	Snow.	Days Snow.
January	50	4	32	1.00	8	7
February	50	8	32	7.84	40½	16
March	60	12	43	2.49	8	11
April	73	31	46	.75	¾	11
May	78	49	57	2.41	-----	-----
June	89	48	61	1.65	-----	-----
July	93	48	75½	.55	-----	-----
August	93	48	71¾	-----	-----	-----
September	88	37	65	.65	-----	-----
October	74	30	52	.45	-----	2
November	69	24	43½	1.10	-----	6
December	43	12	30½	3.68	34	12

Monthly average temperature, 50%.

Total rain and snow, 26.90.

First frost, April 19th, did no damage.

Frost on September 2d, 3d, 29th, and 30th, did some slight damage.

The first killing frost of the season occurred on October 1st, 2d, and 3d, destroying all kinds of vegetables.

Thunder storms occurred on April 17th and October 15th.

Hail storms occurred on April 7th and 24th.

The soil along the streams is either a dark or a sandy loam; on the plateaus generally a light red loam. On the foothills and mountains is a decomposed lava formation, which also enters largely into the composition of the valley and lowland soil. The soil of the greater part of Honey Lake Valley is a sedimentary deposit from the waters which once covered its entire area, mingled with a certain proportion of humus, or mold, from decayed vegetation, the accumulation of ages. It is charged with all mineral elements needed for constant production of crops. No diminution in the yield is observed, after thirty years' continuous cropping, with little rotation of crops.

The soil is several feet deep, and underlaid by what is perhaps equally fertile, but heavier strata, carrying more clay. The valley has no "hardpan," "hog wallows," and few mounds of any sort, no gullies, rocks, or other impediments to easy cultivation. In general, it would be called a rich, sandy loam, but in places is of a more clayey nature. East of Honey Lake it is lighter colored, being a volcanic ash, much resembling the fertile "white ash" land in Fresno County.

Owing to its rigorous winters and lack of rainfall in the summer months, irrigation is absolutely needed in most parts of Lassen County to grow crops. No winter crops can be grown in the season of precipitation, and in the summer, when climatic conditions are favorable, no rain falls. To meet this difficulty Lassen has several irrigation works completed or under way, that will make arable a large area of now bar-

ren land. The Lassen County "Advocate" gives the following description of some of the irrigating work that has been done in this county:

"As Susan River, after it leaves the mountains at Susanville, flows its entire course of 20 miles eastward to Honey Lake, through level bottom lands, at times spreading into several channels, irrigating as it goes thousands of acres of natural grass meadows, it follows that reservoirs cannot be built along its banks outside the mountains. But many years ago Ben Leavitt conceived the idea of taking water from the river during flood times, and carrying it to a natural depression, basin, or lagoon, situated 8 miles below Susanville, at an elevation above the river. Its level bottom of more than a mile square is sometimes covered with water several feet deep, from hills on its south side, and Leavitt discovered that by making an early levee on the north side about 2 miles long, a storage basin would be made where water could be stored to the average depth of about 25 feet, over an area of about 2,000 acres. So far as we are informed, this is the largest reservoir in California, or known to us anywhere. Each acre, with water 1 foot deep, contains 43,560 cubic feet, and 2,000 acres, at same depth, 87,120,000 cubic feet, and 25 feet in depth equals 2,178,000,000 cubic feet, or 16,335,000,000 gallons. This basin is known as Lake Leavitt, and is now in condition to hold in reserve an average depth of 10 feet, and at the outlet a 22-inch iron pipe, with gate, is placed.

"Water is taken from the river, and is flowing into Lake Leavitt by two canals. One was commenced several years ago, and opened to the lake, and was last year enlarged to a capacity of about 500 inches, miner's measurement. It is about 4 miles long. The other feeding canal, just completed, is 5 miles long, 30 feet wide on the bottom, about 3 feet deep, and will be deepened next year. The fall is 24 inches per mile. Excepting two short cuts and two short fills, the earth is all thrown on the northern, or lower side of the canal. With this majestic artificial river, flowing at as great speed as the safety of the banks will permit, it will not take long to fill Lake Leavitt. Unappropriated water has already gone to Honey Lake this season sufficient to fill the reservoir many times over, and the flow will keep up and increase most of the time until next June.

"Water is taken from the river and diverted into these canals by two dams, built under the direction of Mr. Leavitt several years ago. The dams are built of stone, logs, and earth, and are as solid as a rock. The central portion is of plank, and can all be removed to allow the floods to pass through, this being necessary in high water.

"In addition to the foregoing, Hutchinson & Leavitt have completed a reservoir at McCoys Flat, 20 miles above Susanville, to the extent of covering about 1,500 acres some 10 feet deep, and will next year enlarge its capacity.

"At Hog Flat, 2 miles below the other, a similar table basin is being converted into a reservoir, although work was suspended by the early fall storms.

"Together with other reservoir work in the county contemplated for the coming season, Hyer & Long, of Madeline, have begun work at Maiden Flat, 2 miles from the plains, where they claim that 400 acres of ground can be covered with water from 15 to 20 feet in depth. When this enterprise is completed, their hay crop will be increased from 250

or 300 tons per season, to 600 or 800 tons, as they have an extra fine body of land awaiting reclamation."

IRRIGATION WORKS IN LASSEN COUNTY.

	Assessed Value.
West Side Ditch Co.....	\$2,000
Meadow Ranch Reservoir.....	2,000
Union Reservoir.....	2,000
Union Reservoir, North Development Association.....	2,000
Hutchinson, Leavitt, and Eagle Lake Water Co.....	2,500
Total.....	\$10,500

There has been a great impetus given to the saving of water by means of reservoirs in Lassen County in the past few years. This work was first begun in 1888, and there are now eight reservoirs, either completed or in course of construction, in the county. These vary in extent from 200 acres to 1,200 acres or over. With these completed vast bodies of land now useless for lack of water will be brought under cultivation.

At Amadee, on the east side of Honey Lake, several artesian wells have been sunk. These are from 150 to 400 feet in depth, and give an average flow of 40 gallons per minute. The cost of sinking these wells is \$1 per foot.

The fruits which grow in the temperate zone do well in Lassen County. Apples, prunes, pears, cherries, peaches, plums, apricots, nectarines, and small fruits are rarely surpassed in size, flavor, or yield. For apples, especially, Lassen County is celebrated, and those grown here are unsurpassed anywhere in California or the East.

No fruit trees in the valley were ever injured by the cold of winter or the sun of summer. Late spring frosts occasionally nip the early vegetables, and the fruit crop is reduced to a greater or less extent about once in three or four years. There are in Honey Lake Valley fifteen or twenty apple orchards, which ship from 5,000 to 20,000 boxes of apples per year by rail. The profit on these orchards is from \$100 per acre upward. J. M. Steinberger says: "I harvested in 1890 about 800 boxes of apples from one acre in my orchard, for which I got \$1 per box on the ranch. The trees were ten years old."

Wm. Cain has four hundred apple trees—Pearmain, Spitzenberg, Winesap, Rhode Island Greening, and Limber Twigs—besides pears, plums, peaches, cherries, etc. He sold last year \$1,500 worth of apples; vinegar and cider, \$400; alfalfa, \$400 (50 tons at \$8); all from 10 acres of sagebrush land. Mr. Cain bought the place he now occupies, just outside of Susanville, in 1882, and has since acquired more land adjoining, so that he now owns 100 acres. He does a general farming business, but it is the object of this sketch to speak more particularly of his orchard.

He has about 10 acres under apple, pear, peach, and plum trees, with quite an assortment of small fruits, cherries, blackberries, strawberries, raspberries, etc. All his fruit he sells to local customers, right at the orchard, and never has enough to supply the demand. He has four hundred apple trees, most of them in bearing. Last year he picked and sold 2,000 boxes, each box containing 50 pounds, and received for his crop 75 cents a box at the orchard. Besides this he had apples for his own use until the following May, and he made 2,000 gallons of cider vinegar, which he sold at 25 cents a gallon. He raises, principally, winter apples of the following varieties: Red and White Pearmain, Spitzen-

berg, Winesap, Rhode Island Greening, and Limber Twigs. His trees are set 30 feet apart, and are not irrigated. Mr. Cain says orchards do not need irrigation, except on high, dry land.

Bartlett pears do splendidly on his place; they sell for \$1 25 a box—other pears at \$1. The pear trees bear so full every year that he has to prop up the branches to keep them from breaking. Plums always yield profusely, and sell at \$1, and he never has a failure of peaches, which sell at the same price, bearing so heavily as to break many of the branches, in spite of his efforts to save them. Cherries also bear well, and come to full maturity, selling at 6 cents a pound.

The apple is the only fruit shipped out of Lassen County in any quantity, and finds its principal market in Los Angeles, San Francisco, Sacramento, Reno, and Virginia City. The fruit is shipped in 50-pound boxes. The estimated output of the apple orchards of this county in 1891 was 30,000 boxes. This year the output will be much smaller, as there is not over half a crop of apples this season, and the new orchards which came into bearing will not add enough to the total to overcome the shortage. The acreage in apples of the principal fruit sections in Lassen County is:

	Acre.		Acre.
Janesville.....	35	Big Valley.....	12
Susanville.....	70	Scattering.....	50
Milford.....	150		
Long Valley.....	20	Total.....	337

The apples grown here are superior in size, flavor, and keeping qualities, and compare favorably in these respects with the best Eastern products.

Fruit has been grown in Lassen for twenty-eight years, the first orchard having been planted by a Mr. Elliott in 1864, with apple trees imported from Oregon. No great progress was made in the industry, however, for many years, and the opening of a railroad in Honey Lake Valley, which gave rapid and easy transportation to market, gave the first impetus to the industry which, from a commercial point, has been the growth of the past few years. The area of orchards in Lassen is being increased annually, by far the greater part of the young trees set out being apples.

ACREAGE AND VARIETY OF FRUITS IN LASSEN COUNTY.

Variety.	Acres in Trees.			
	Bearing.	Non-Bearing.	Total.	Plant of 1890.
Apple.....	300	37	337	12
Apricot.....	30	23	53	10
Cherry.....	2		2	
Peach.....	10	15	25	7
Prune.....		2	2	
Pear.....	58	10	68	3
Plum.....	14	7	21	1
Nuts—Almond.....		1	1	
Walnut.....		2	2	
Small fruits.....		74	74	
Totals.....	414	171	585	33

LOS ANGELES COUNTY.

In wealth, population, and resources Los Angeles is the most important county in Southern California, and ranks next to San Francisco in the State. She has within her boundaries 4,812 square miles of territory, or 2,613,000 acres. Kern County bounds her on the north, San Bernardino on the east, Ventura on the west, and the Pacific Ocean and Orange County on the south.

There are two rivers in Los Angeles County, one named the Los Angeles, the other the San Gabriel. During a large part of the year these are mere dry beds of sand, what little water they contain finding its way through the porous sand or the bedrock. In the winter months they are dangerous streams. The Los Angeles River rises in the western part of the San Fernando Valley, about 12 miles northwest of the city, and flows easterly 18 miles to the Los Angeles Pass. Its stream is fed all along by springs. Two other "rivers," the Pacoima and the Tejuanga, join it in the San Fernando Valley. Turning south, it flows through the Los Angeles Pass, and on through the city. In former years its waters flowed through the southwestern part of the city, and out through the Cienega district, and emptied into the ocean through La Ballona Harbor. Subsequently the river changed its course, and for years emptied its waters into the lowlands around Compton and Wilmington.

The San Gabriel River has two principal sources in the Sierra Madre. The north fork rises in T. 2 N., R. 12 W., San Bernardino base and meridian, and flows easterly through three townships into T. 2 N., R. 9 W., where it forms a junction with the east fork. The latter stream rises in T. 3 N., R. 9 W., and flows southerly. From the point of junction the river flows southwesterly to the ocean. For years before the great flood of 1825-26 it discharged its waters into the lowlands north of Wilmington. After that it joined the Los Angeles River in T. 4 S., R. 13 W. The winter of 1867-68 witnessed another great flood. The San Gabriel River then broke over its banks in T. 2 S., R. 11 W., and flowing southerly cut a new channel through to Alamitos Bay. Since that time its waters have been divided between the old and the new channels.

Los Angeles County rises in three terraces from the sea to a height of 2,200 feet. Back of these elevated plains are mountain ranges from 5,000 to 6,000 feet high, with occasional peaks having an altitude of 9,000 to 10,000 feet. The lowest of these three great benches rises from the sea to an altitude of about 500 feet. South and west the Pacific Ocean washes its shores. On the north side of this first terrace or plain is a range of hills, which have an average altitude of 1,500 feet. They run easterly from the Ventura coast-line through the county to the San Bernardino county line.

The terrace itself is divided into two valleys. The one to the northwest is known as the Cahuenga Valley, and the one on the southwest as the Los Angeles Valley. The "divide" between the two valleys, however, is very slight. This is shown by the old bed of the Los Angeles River, which formerly crossed this "divide" and found an entrance to the ocean through the lake called La Ballona, which is situated at the mouth of the Cahuenga Valley. This latter valley's greatest length is about 20 miles, and its greatest width about 10 miles, but is quite irregular in shape. On the west a table-land projects southerly from

the Santa Monica hills along the ocean shore to La Ballona Lake, and easterly from the ocean shore-line for some 3 or 4 miles. On the south side of the valley the table-land rises again, and culminates in the high point of the Palos Verdes Peninsula.

The Los Angeles Valley, or properly a plain, is some 50 miles long by 20 miles wide. It reaches over into Orange County on the southeast, and lies between the ocean on the south and the Puente and San Gabriel hills on the north. The surface of this valley rises gently from the sea to an altitude of some 500 or 600 feet.

The second grand terrace consists of the magnificent valleys of San Fernando and San Gabriel. These valleys are separated from each other by a small spur of hills known as the San Rafael, which project southerly from the Sierra Madre Mountains, and terminate opposite the Los Angeles Pass. The San Fernando Valley is about 36 miles long by 12 miles wide. It has a gentle slope from the Sierra Madre on the north toward the Santa Monica and Cahuenga hills on the south. On the west side are the Santa Susana hills. The valley has an elevation above the sea-level from about 500 to 1,000 feet.

The San Gabriel Valley is about 25 miles long by 10 miles wide. Like the San Fernando Valley, it slopes gradually from the Sierra Madre down to the San Gabriel and Puente hills. Its elevation runs from about 500 to 1,500 feet.

Rising to the north of the two valleys of San Fernando and San Gabriel, which form the second terrace, are the Sierra Madre Mountains. The average height of these mountains in Los Angeles County is about 5,000 feet. Their highest point in this county is Mount San Antonio, commonly known as Old Baldy, which has an altitude of over 9,000 feet. These mountains are very precipitous on their southern slopes, but have a gentler slope on the northern sides.

The third grand terrace includes all that part of the Mohave Desert known as the Antelope Valley, lying between the Sierra Madre on the south and the Sierra Nevada on the north and west. The east line of Antelope Valley is defined by the Lovejoy Buttes, a spur of detached hills from 150 to 250 feet high, which run northeasterly from the Sierra Madre. Antelope Valley is about 60 miles long east and west by some 25 miles wide north and south. The surface of the valley has a general slope to the northeast. The average altitude of the valley is 2,200 feet above sea-level.

The Sierra Nevada, which constitutes its northern and western boundaries, is a chain of great peaks and mountain ridges, which come down the eastern boundary of the State, at an average altitude of 7,000 feet.

There are no lakes of any size in Los Angeles County. Elizabeth Lake, near the southwestern part of Antelope Valley, consists of three separate bodies of water, which are connected with each other by small streams. The total surface area is about four square miles. There is another small lake in a granite basin of the Sierra Madre, about opposite and north of Pasadena. It has a surface area of a mile or two square. Occasionally, during the winter, its waters overflow into the west fork of the San Gabriel River.

The soil of the valleys at the base of the Sierra Madre range is composed largely of decomposed granite, in many places forming a sharp sand with an admixture of alluvial soil. At the base of the mountains is a wide stretch of mesa land, reddish in color, a sandy loam with a

depth of 10 to 80 feet. These mesas are thought to be remains of a vast plateau that once covered the whole valley, but which have been washed down by the storms of ages. The rivers have washed away this red soil, except upon the higher mesas, and left on the northern portion gray and blackish granite loams underlaid by enormous gravel beds, in which are found heavy bodies of artesian water. At San Gabriel a mixture of granite and red loam is found. At Pasadena and on the higher bench lands there is a larger proportion of sand and gravel; on the Alhambra tract a heavier soil prevails. At Westminster, Anaheim, and some other points there are coast flats several miles in width, sloping gently to the sea. The upper valleys possess all grades of alluvium, and have also in some places a black adobe, which is largely composed of dead vegetable matter. The soil in the lower valleys consists of a rich alluvial deposited by streams in past ages, varying according to the amount of sand or clay it contains; on the mesas (table-lands) is largely found a soil composed of debris washed from the mountains, mixed with vegetable accumulation. This makes an excellent fruit soil. This vast range of its soil, altitudes, and other conditions, makes practicable the successful culture of all kinds of fruits, vegetables, or grains that can be raised north of the tropics.

So much has been written about the climate of Los Angeles that it has become an oft-told tale, but it is to its climate more than to any other one thing that Los Angeles, in common with all Southern California, owes its success in the horticultural field. There is a great diversity in the climate here between the coast and the interior.

Says Dr. H. S. Orme: "On the coast the atmospheric humidity varies from 69 to 75 per cent during the winter months, and from 60 to 68 per cent during the summer months. Twenty miles inland the humidity is much diminished, and 100 miles from the coast the percentage varies from 30 to 50. Foggy nights and mornings occur during the change of seasons, the fog rolling in from the sea through the passes and valleys, but seldom reaching ground elevated 1,000 feet, nor extending far from the coast."

During the decade from 1877 to 1888, inclusive, there were but thirteen days on which the temperature rose to, or exceeded, 100°, and eight days on which it fell to 32° or below. The average number of days, annually, on which the temperature exceeds 90°, is only fifteen. The highest recorded temperature was 108.5°, in September, 1885, and the lowest, 28°, in February, 1883.

The following table gives the highest, lowest, and mean temperature, by months, for the past fourteen years:

	1877.	1878.	1879.	1880.	1881.	1882.	1883.	1884.
January—								
Highest		72.0	73.7	76.0	71.0	74.2	82.0	78.0
Lowest		37.0	36.0	30.0	37.0	32.0	30.0	33.7
Mean		54.9	52.2	51.3	51.7	49.4	53.5	53.9
February—								
Highest		71.0	80.5	70.5	86.0	76.7	82.0	81.0
Lowest		41.0	38.6	33.5	42.5	32.0	28.0	38.5
Mean		55.0	55.5	50.1	57.9	50.3	52.3	55.1
March—								
Highest		76.0	79.0	73.5	89.0	87.8	84.0	72.5
Lowest		41.0	42.5	36.0	37.0	35.3	42.6	37.0
Mean		56.0	58.5	51.1	55.8	55.3	56.7	54.8
April—								
Highest		80.0	88.5	83.0	94.0	80.0	89.0	80.0
Lowest		41.5	42.2	40.0	48.0	40.2	39.0	41.5
Mean		57.8	58.7	55.9	61.4	56.4	57.3	57.2
May—								
Highest		89.0	97.0	97.0	89.3	86.1	100.0	79.0
Lowest		47.0	43.0	42.0	41.0	42.1	39.5	47.0
Mean		62.2	61.0	61.1	62.7	61.7	62.1	61.6
June—								
Highest		81.0	103.5	83.0	88.0	87.1	100.0	98.0
Lowest		47.0	50.5	50.0	48.0	49.6	52.0	49.5
Mean		65.0	65.8	63.4	65.5	64.4	68.8	65.6
July—								
Highest	93.0	88.0	84.5	85.0	85.1	98.1	90.0	99.0
Lowest	55.0	52.0	52.0	52.0	52.1	52.3	52.5	51.5
Mean	71.1	67.7	64.8	64.2	68.8	68.0	69.8	70.2
August—								
Highest	87.0	89.0	97.5	87.0	99.8	98.9	98.0	101.5
Lowest	56.0	54.0	53.0	52.0	52.1	57.0	50.0	52.5
Mean	70.0	68.7	69.5	66.4	69.4	71.0	69.8	71.3
September—								
Highest	93.0	103.0	101.0	91.0	102.0	100.0	103.5	92.5
Lowest	52.0	50.0	47.0	44.0	50.0	46.0	53.0	45.5
Mean	69.6	65.6	67.2	64.5	67.9	67.6	71.9	65.5
October—								
Highest	80.0	91.0	96.5	89.0	82.3	88.0	83.0	89.1
Lowest	43.0	43.0	42.5	44.0	43.0	44.0	43.5	42.9
Mean	63.0	63.1	64.3	62.0	60.9	63.0	61.0	62.3
November—								
Highest	86.0	81.0	84.5	85.0	80.8	81.0	84.0	88.0
Lowest	45.0	37.0	36.5	35.0	34.2	36.0	42.0	38.7
Mean	62.1	58.3	55.2	55.5	57.5	57.3	59.2	59.6
December—								
Highest	81.0	88.2	76.0	80.0	79.3	82.0	80.0	75.6
Lowest	36.5	30.0	30.0	38.0	35.3	35.0	37.0	45.5
Mean	56.0	54.4	51.9	55.6	54.7	56.4	56.3	52.3

	1885.	1886.	1887.	1888.	1889.	1890.	1891.
January—							
Highest	71.6	75.3	79.6	71.0	71.0	67.0	80.0
Lowest	38.0	32.0	33.1	30.9	32.0	34.0	34.0
Mean	53.9	54.7	55.4	50.0	52.0	49.0	56.0
February—							
Highest	81.0	81.0	81.5	73.5	84.0	81.0	71.0
Lowest	36.3	41.1	35.4	39.2	33.0	35.0	73.0
Mean	56.6	59.5	51.6	54.4	56.0	54.0	53.0
March—							
Highest	85.1	76.0	85.0	79.0	81.0	81.0	82.0
Lowest	42.3	37.2	41.1	35.9	44.0	40.0	40.0
Mean	60.6	54.3	59.1	55.1	59.0	58.0	58.0
April—							
Highest	88.6	80.0	87.0	99.0	93.0	94.0	86.0
Lowest	44.8	42.3	40.3	44.0	46.0	42.0	42.0
Mean	61.9	57.2	59.1	61.9	62.0	59.0	59.0
May—							
Highest	80.0	89.0	92.0	83.0	94.0	96.0	74.0
Lowest	48.6	44.2	44.5	45.0	46.0	43.0	47.0
Mean	63.5	62.4	63.1	60.8	63.0	63.0	62.0
June—							
Highest	90.1	91.6	100.1	94.0	81.0	105.0	89.0
Lowest	47.0	48.2	46.7	50.5	51.0	48.0	49.0
Mean	65.0	66.1	66.1	67.5	66.0	68.0	66.0
July—							
Highest	98.5	98.1	98.1	95.0	99.0	97.0	109.0
Lowest	52.4	50.4	51.1	49.0	54.0	55.0	54.0
Mean	70.0	69.7	69.5	67.9	71.0	73.0	74.0
August—							
Highest	105.6	98.1	93.6	97.0	95.0	98.0	96.0
Lowest	51.2	53.7	52.1	51.3	55.0	56.0	54.0
Mean	72.7	71.8	68.5	67.6	72.0	73.0	75.0
September—							
Highest	108.5	91.3	91.0	98.2	103.0	94.0	100.0
Lowest	51.2	48.3	49.2	55.0	52.0	54.0	52.0
Mean	69.5	65.6	68.2	68.4	73.0	71.0	73.9
October—							
Highest	102.3	82.2	93.2	98.0	89.0	99.0	89.0
Lowest	41.6	41.1	47.2	44.0	50.0	46.0	46.0
Mean	64.8	59.3	65.0	61.9	66.0	68.0	66.0
November—							
Highest	78.5	84.9	86.0	84.0	82.0	96.0	85.0
Lowest	40.3	34.1	38.8	40.0	43.0	41.0	40.0
Mean	59.5	56.6	60.0	57.0	62.0	66.0	61.0
December—							
Highest	82.0	84.8	73.2	79.0	68.0	82.0	-----
Lowest	40.3	37.3	35.2	41.0	40.0	43.0	-----
Mean	57.9	55.7	53.7	55.0	54.8	61.0	-----

The following table shows the monthly, annual, and average precipitations, including deposits from fog and dew, in inches and hundredths:

Year.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Ann'l.
1878....	3.33	7.68	2.57	1.71	.66	.07	.00	.00	.00	.14	.00	4.70	20.86
1879....	3.59	.97	.49	1.19	.24	.03	.00	.00	.00	.93	3.44	6.53	17.46
1880....	1.33	1.56	1.45	5.06	.04	.00	T.	T.	.00	.14	.67	8.40	18.65
1881....	1.43	.36	.66	.46	.01	.00	.00	T.	T.	.82	.27	.52	5.53
1882....	1.01	2.66	2.66	1.83	.63	T.	.00	.00	T.	.05	1.82	.08	10.74
1883....	1.62	3.47	2.87	.15	2.02	.03	T.	.00	.00	1.42	.00	2.56	14.14
1884....	3.15	13.37	12.36	3.58	.39	1.39	.02	.02	T.	.29	1.07	4.65	40.39
1885....	1.05	.01	.01	2.01	.06	T.	T.	T.	.05	.30	5.55	1.65	10.60
1886....	7.78	1.41	2.52	3.32	.01	.11	.27	.21	.11	.02	1.18	.26	17.20
1887....	.20	9.25	.29	2.30	.20	.07	.07	T.	.18	.17	.80	2.68	16.27
1888....	6.04	.80	3.17	.12	.05	.01	.04	.10	.03	.40	4.02	6.26	21.04
1889....	.25	.92	6.48	.27	.65	.00	T.	.68	.00	6.96	1.35	-----	12.69
1890....	7.83	1.36	.66	.22	.03	.02	T.	.03	.06	.03	.13	2.32	-----
1891....	.25	8.56	.41	1.26	.31	.00	T.	.00	.06	.00	.00	-----	-----

T indicates inappreciable precipitation.

Los Angeles is well supplied with irrigating facilities. At Pomona the old settlement ditch, with a capacity of 100 inches, covers a large portion of the old settlement; this is supplemented by the Pomona Land and Water Company's Pomona ditch, the whole covering an area of about 6,000 acres. In the neighborhood of Pomona are the Fleming & Roher works, for which the water is obtained by a tunnel at the base of San Antonio; the Packard works, which derive their supply from artesian wells in the artesian belt above Pomona. At San Dimas the water supply is derived from the cañon of the same name, and is controlled by the San José Rancho Company. At Glendora the water supply is derived from the Big Dalton Cañon, and covers an area of some 800 acres. South and east of San Gabriel Cañon is the Azusa irrigation neighborhood. The old Azusa, or Dalton, ditch serves the land of the Azusa Rancho and the lands of the old settlement.

The three old ditches, the Azusa, Duarte, and Beardslee, receive their waters by a tunnel driven 796 feet through solid rock. This tunnel is 6 feet high, 5 feet wide, and its ceiling arched.

At Duarte the waters of the San Gabriel River are diverted at the opening of the cañon by the Duarte Mutual Irrigation and Canal Company and the Beardslee Water Ditch Company.

Monrovia and Santa Anita get their supply from Sawpit Cañon, the water of which is equally controlled by the Santa Anita Water Company and W. L. Bradbury. The total output of this cañon is between 65 and 85 inches. Beyond Sawpit Cañon is Little Santa Anita Cañon, the flow from which is divided between the Santa Anita Rancho and the Sierra Madre Water Company. Besides these works, the San Gabriel Valley is watered by supplies from Davis, Eaton, Rubio, and Los Flores Cañons and minor sources. The supply from these is largely increased by the development of the flow from cienegas, natural springs, and artesian wells.

At San Fernando, the low-water flow of the Pacoima Cañon is all claimed by the San Fernando Land and Water Company. Their water is obtained by means of a submerged dam, and is conveyed to their lands by a pipe system. Other companies claim the water of San Fernando and Mormon Cañons. In the Los Angeles district, water is

derived from the Los Angeles River. The water is owned by the city and sold by it to the irrigators.

The Santa Ana River leaves San Bernardino County, passing through the Santa Ana Cañon, and for 10 or 12 miles out of the cañon it is flanked by two of the most important irrigation districts in Southern California. That on the south, embracing the well-known towns and neighborhoods of Orange and Santa Ana, is served by the Santa Ana Valley Irrigation Company's canal, and that on the north and west sides of the river by the several works of the Anaheim Union Water Company, whose district is best known by the general name of Anaheim. In addition to these there is an old independent work on the north side, known as the Yorba Ditch, which serves the county within 2 or 3 miles of the mouth of the cañon. These include the principal irrigation works of the county. Connected with them are innumerable service ditches and minor systems.

Los Angeles, centrally located in Southern California, is, of course, in the heart of the citrus section, and one of her principal horticultural industries lies in the direction of citrus growth. While it is upon this branch of horticulture that the reputation of Los Angeles County is built, the soil, climate, and topography of the county fit it for excellence in the production of a long line of other fruits.

The orange does especially well in the San Gabriel Valley, at Pasadena, at Pomona, and the intervening country. Of the output of oranges for the year 1891, Pomona contributed ninety-seven carloads, nearly 1,000 tons of fruit. The citrus industry had its origin in Los Angeles County, at San Gabriel, where, in 1771, the Mission Fathers first established a settlement in the county, and immediately planted their orchards, in which the orange found a prominent place.

In 1831 the first orange orchard was planted in the city of Los Angeles by Jean Louis Vignes. He obtained the trees from the San Gabriel Mission, where a good orchard had flourished for more than a generation. Twenty years later his trees were yielding about 6,000 oranges a year. Some time later the late D. B. Wilson went quite extensively into orange culture in San Gabriel Valley, and the late Wm. Wolfskill set out the first large orchard in Los Angeles, where the Arcade depot now stands. Small orchards were planted in various parts of this section, but it was in the last years of the decade ending in 1870 that the first effort to make orange growing a distinctive industry in that section was undertaken by the late Judge North, the founder of Riverside. From that time up to the present the development of the industry has been more or less continuous. From 1880 to 1884 there was great activity manifested in planting more orchards; but about this time the appearance of the white cottony cushion scale, and the ravages already wrought by the red scale, acted to check the setting out of trees. The insect pests that attacked the orange groves in this section were as strange a dispensation as ever was chronicled in the history of any enterprise on record.

About 1880 the yellow scale made its appearance in this county at Sunny Slope. It came from Australia on some imported trees. A few years later the white cottony cushion scale (*Icerya purchasi*) made its appearance almost simultaneously at a dozen places in the county. For years the most indefatigable war was maintained against the two pests. Horticulture was a new business to the most of the

orange growers, and the strange nature of these pests made them formidable to the most intelligent and most experienced men in the business. All sorts of washes, sprays, and gases were tried, but to little practical avail. The trouble with them was that all parts of the tree could not be reached, and whenever a bug was left he increased and multiplied after the law of his kind so rapidly, that before an orchard of five acres could all be treated those trees first sprayed were again infested. All sorts of methods were tried, and it was alleged that the carelessness of the growers was largely at fault. Of course, great care kept the trees clean for awhile, while neglect allowed the bugs to spread over an orchard in a month. Many intelligent people thought some remedy would grow out of natural laws by which the destructive parasites would be swept away. There were many reasons for such a hope, but hope deferred makes the heart sick in this as in other affairs. During the summer of 1888 there seemed to come a ray of hope. The white scale bug died from some cause, so that millions of the pest perished from the trees. Orchards which had been covered as if with snow became partially clean. But some other remedy had to be found, or the pest might return and the orchards be lost. It was at this time that the *Vedalia cardinalis* was introduced, and its work was magical. The cottony cushion scale is gone, and the orchards this pest had well nigh destroyed are rejoicing in a new and vigorous growth that is manifest to the eye as far as the orchards can be seen. The *Vedalia cardinalis* is here, while the scale has been destroyed. The new-comer has become thoroughly acclimated, and has taken up his home here, and the orange growers bid defiance to their great enemy, the cottony cushion scale.

The yellow scale, too, has disappeared from the orchards of this section. This scale also attacked trees in Australia and Japan many years ago, and for a time threatened the very existence of the industry in those countries. During the past few years this pest has slowly disappeared from the trees there, and now the grower thinks little of its depredation. The same thing has taken place here. Several parasites have attacked this one, and the yellow scale disappeared to a large extent from all the orchards in this section.

Not so much attention has been given to lemon growing as has been paid to the orange; enough has been done, however, to show that in many parts of Los Angeles County the lemon will grow beside the orange. The orange has heretofore been the favorite citrus fruit for several reasons. It is much more hardy than the lemon, standing a degree of temperature below the freezing point that would destroy the more tender lemon; it flourishes on soil that would not suit the lemon, which is more fastidious, and there has been a large demand for the entire output of oranges at large prices. This array of facts has turned the greater part of the attention of citrus growers to the orange, and left the lemon in comparative neglect. Experience, however, is demonstrating the fact that the lemon is a very profitable crop, that it has many advantages that the orange does not possess, and that there are large areas of land in Southern California and in Los Angeles County where it will do well. The result of this is that in the past year or two much more attention is being paid to this valuable fruit, and large tracts are now being set to it.

What has been said of the lemon is true to a great extent of the lime. Some years ago the lime occupied a prominent position among the citrus

orchards of Los Angeles, and gave promise of becoming an important factor in the horticultural history of Los Angeles; but a series of cold years in which the trees were nearly all frozen discouraged the growers, and but little attention has since been given to it. There are, however, many places in this county where the lime flourishes, and where it does it is very profitable.

During the past few years considerable attention has been given to olive growing in Los Angeles County, and especially in the vicinity of Pomona large tracts of land have been set to this fruit. Already Pomona pickled olives have established for themselves a reputation in the market, and last year the manufacture of oil was begun. As the olive orchards here are all in their infancy as yet, each year will necessarily see the output increase and the industry grow steadily in importance.

Where attention has been paid to it, the fig has proved a profitable crop, the soil and climate of many parts of Los Angeles County seeming especially suited to its development.

The whole line of deciduous fruits do well, and peaches and apricots yield very large returns. Nuts of fine quality, especially almonds and English walnuts, attain their perfection in this county, and the last named form an important item in the products of the county.

So far the growing of English walnuts in this part of the State has been satisfactory, and as the industry becomes better known it grows in popularity. About a dozen ranchmen in the vicinity of Downey and Rivera report profits on last year's crop ranging from \$300 to \$350 per acre. It further appears that they realized not less than \$300 per acre for the past eight or more years. We are also told that there are some twenty men at Downey who do not get less than \$225 an acre for their crop.

The Pomona "Progress" says that the English walnut crop of California amounts to a million and a half pounds, and is growing very rapidly. This crop represents a total income to the growers of about \$170,000, fully five sixths of which is credited to Los Angeles and Santa Barbara Counties. The trees are wonderfully sure bearers, and appear to grow with great vigor most anywhere in Southern California. It is therefore easy to understand why so many are being planted. They do exceedingly well in the vicinity of Santa Monica. Mr. Boyer, who owns a ranch in the Ballona, has a number of trees that are only five years old, from which he gathered 150 pounds to the tree last season. This is in the low, damp lands. The growth seems to be equally satisfactory in the foothills, and the upland ranches are planting quite extensively. A test was also made last year in the cañon. J. A. Pritchard, who is a local agent of Senator Jones, planted quite an area in Sepulveda Cañon, near the big reservoir of the Soldiers' Home. They made a surprising growth last year, and show as much vigor and health as one can see anywhere. Much of the large area of land now sown to grain will no doubt, within a few years, be planted to walnuts, as also will the cañons and foothills.

Through the courtesy of their Secretary, Mr. J. A. Montgomery, we are enabled to give the names of members of the Los Nietos and Ranchito Walnut Growers' Association, number of sacks of walnuts each had, the weight, and also amount of money each received for the same, viz.:

Name.	Sacks.	Pounds.	Amount Received.
T. R. Parsons	100	10,267	\$850 07
J. C. Perkins	102	10,963	913 28
Mrs. H. S. Flora	245	26,650	2,190 04
William Moss	260	28,075	2,281 85
A. Dorman	335	36,245	2,967 05
J. P. Fleming	120	12,823	1,053 84
J. H. Martin	82	8,956	735 38
J. W. McGaugh	75	7,952	651 02
G. W. Maxson	47	5,067	415 60
J. H. Davis	29	2,837	235 88
O. P. Passons	225	23,960	1,952 91
E. Poyoreno	171	19,609	1,595 61
T. L. Gooch	206	23,060	1,895 54
James Root	33	3,687	299 36
S. G. Reynolds	55	6,209	504 46
James M. King	80	8,649	713 07
John Tweedy	178	18,778	1,549 29
G. W. Cole	74	7,907	717 93
J. J. Tweedy	1,691	7,493	1,505 40
H. W. Judson	164	17,416	1,446 33
William Caruthers	113	12,379	1,047 24
H. Sarrasin	34	3,698	299 98
William Wood	4	396	32 67
J. J. McClelland	71	8,113	666 71
James Stewart	58	5,937	480 62
Cyrus Brown	23	2,331	192 32
A. H. Dunlap	212	22,365	1,853 18
J. D. Durfee	86	9,111	741 03
Mrs. F. A. Ardis	51	5,579	458 34
D. W. Cate	127	12,788	1,143 68
Harry Moss	54	5,362	482 62
J. Clay	68	7,499	619 03
C. A. Coffman	155	15,923	1,425 79
H. L. Montgomery	535	54,999	4,541 16
T. M. Passons	291	30,359	2,507 48
John Bangle	269	27,344	2,406 30
R. M. Fuller	120	12,763	1,067 92
Mrs. S. J. Boyd	291	31,496	2,637 53
L. L. Bequette	332	34,016	2,844 41
Wilbur Cate	111	11,018	972 40
J. T. Rankin	94	10,310	840 19
J. W. Standlee	31	3,248	267 97
P. G. McGaugh	215	22,589	1,648 22
D. White	68	7,040	530 05
James Barlow	122	13,151	1,071 75
William Story	80	9,328	670 15
C. S. Sanderson	50	5,550	399 85
P. O. Johnston	38	4,117	294 41
M. Holbrook	144	14,918	1,228 12
S. B. Root	11	1,211	85 39
John M. King	11	1,108	80 33
Totals	8,141	692,649	\$58,010 75

Walnuts are usually graded in two sizes and packed in 100-pound sacks. The prices paid last year were:

Soft-shell, first grade	9 cts. per lb.
Soft-shell, second grade	8½ cts. per lb.
Hard-shell, first grade	8½ cts. per lb.
Hard-shell, second grade	7 cts. per lb.

This season's crop is reported as very large and selling at an advance over last year's prices. Besides walnuts, Rivera grows a large amount of citrus fruits, which are shipped East, and deciduous fruits, which mostly find their way to the local cannery. Prices paid by the cannery this year have been: for peaches, \$25 per ton; for pears, \$20, delivered.

At Pasadena the principal growth is in citrus fruits, with some peaches, prunes, nectarines, and other varieties. The crop of oranges for 1892 was very light, owing to a severe wind which swept over the whole of Southern California in November of last year. The outlook for the present season, however, is very excellent, and if no unforeseen contingencies arise to cause a shortage the crop of 1893 will be very large. Peaches have yielded a full crop, but a shortage is reported in prunes and apricots.

A very excellent showing in favor of the grower is made in the advance of prices this season, as will be seen from the following statement of prices paid at Pasadena for dried fruit last season and this:

	1891.	1892.
Peaches, per pound	7c.	12½c.
Prunes, per pound	6c.	10c.
Apricots, per pound	5c.	12c.

A very material increase in the acreage of fruit in the Pasadena section has been made during the present year, a careful estimate showing the following:

	Acre.		Acre.
Apple	109	Orange	136
Apricot	2	Nuts—Almond	7
Cherry	25	Walnut	3
Fig	25	Pear	11
Peach	300	Olive	10
Prune	210		
Nectarine	2	Total	885
Lemon	45		

Pomona is one of the most important fruit sections of Los Angeles County, and produces a wide range of fruits, including, in order of importance, oranges, lemons, prunes, peaches, apricots, wine grapes, Seedless Sultanias, pears, blackberries, olives, and figs. The principal markets are Los Angeles and San Francisco. A great deal of fruit is shipped direct to the East—Chicago, Philadelphia—and much is also sent to New Mexico and Arizona. Henry H. Wheeler, who puts up an extra fine quality of fruit in fancy packages, reports having sold his pack at the following prices:

Dried apricots: 25 cents per lb.
Dried peaches, peeled: 30 cents per lb.
Dried peaches, extra: 40 cents per lb.
Dried prunes: 20 cents per lb.

These packs netted Mr. Wheeler 3 to 4 cents less than the figures quoted.

Pomona reports large crops of apricots and peaches, but not so large as that of last year. Prunes short, but the fruit extra fine; olives not so abundant as last year; oranges very good; lemons short. There was an immense crop of blackberries, and a very large yield of grapes. The ruling prices this season, delivered, were:

Apricots: Nearly all at \$20 per ton; few at \$15; few at \$25.
Peaches: \$15 to \$45 per ton, for from poor to finest kinds.
Prunes: Great many at \$50 per ton; some at \$30, early in season.
Olives: A local buyer is offering \$80 per ton.
Wine grapes: Offering \$8 per ton; but growers have agreed to sell for \$14, or dry them.
Blackberries: Three to 4 cents per pound.

The acreage in the Pomona district set to fruit this season is:

	Acre.		Acre.
Apple.....	10	Lemon.....	206
Apricot.....	70	Orange.....	1,252
Cherry.....	1	Nuts—Almond.....	2
Fig.....	48	Walnut.....	165
Olive.....	148	Chestnut.....	1
Peach.....	61		
Prune.....	318	Total.....	2,306
Pear.....	24		

At La Cañada, La Crescenta, and Monta Vista, apricots, peaches, prunes, pears, and wine grapes are the prevailing fruits. These are mostly boxed and shipped green to the East. The first carload of green apricots from Southern California to the East was shipped from J. Minott Ward's ranch, in La Cañada, on July 28th, consigned to Chicago.

The area of new land set to fruit in this section in 1892 was:

	Acre.		Acre.
Apple.....	7	Orange.....	15
Apricot.....	7	Walnut.....	3
Fig.....	7		
Olive.....	3	Total.....	50
Lemon.....	8		

In the district around Verdugo—Glendale, West Glendale, and Tropic—the orchard products are, in order of importance, peaches, apricots, oranges, lemons, pears, prunes, grapes, and berries. These are usually disposed of to local dealers. The crop for this season is reported as light for all classes.

The acreage of new fruit planted this season in this district is:

	Acre.		Acre.
Apple.....	5	Prune.....	11
Apricot.....	10	Lemon.....	10
Fig.....	6	Orange.....	13
Olive.....	5	Walnut.....	7
Peach.....	10		
Nectarine.....	6	Total.....	83

Cahuenga Valley is not a regular fruit section, but still it produces largely both citrus and deciduous fruits, and is especially adapted to the apricot. All fruit in the district, except prunes, returned a full crop this season. The acreage set at Cahuenga this season is:

	Acre.		Acre.
Apricot.....	11	Walnut.....	7
Pear.....	6		
Lemon.....	10	Total.....	42
Orange.....	8		

Eagle Rock Valley is a comparatively new fruit district, and the greater part of its orchards have been planted in the past two years. In the spring of 1892 there was set out the following acreage:

	Acre.		Acre.
Olive.....	30	Table grapes.....	20
Prune.....	20	Strawberries.....	2
Pear.....	25	Raspberries.....	2
Plum.....	25	Blackberries.....	5
Lemon.....	20		
Orange.....	40	Total.....	194
Walnut.....	5		

San Fernando is rapidly assuming an important position as a citrus fruit section, and some fine fruit is already shipped from there. The crop this season is promising well; trees are heavily laden and the fruit of superior size. The new acreage there and in the other principal sections of Los Angeles, is as follows:

Variety.	San Fernando.	Whittier.	Burbank.	Long Beach.	Rivera.	Downey.
Apple.....	21	20	242	46	8	31
Apricot.....	11	8	199	4	6	7
Cherry.....	12	76	3	1	15	20
Fig.....	8	41	65	27	43	
Olive.....	3	45	365	31	35	6
Peach.....	100	25	295	5	11	52
Prune.....	8	25	420	10	11	
Pear.....	1	20	40	12		2
Plum.....	40	25		7	24	6
Lemon.....	50	195	21	8	215	220
Orange.....		2	3			
Nuts—Almond.....	14	503	1,400	64	575	703
Walnut.....	6					
Raisins.....	8					
Table grapes.....						
Totals.....	282	985	3,123	235	943	1,057

ACREAGE AND VARIETY OF FRUITS IN LOS ANGELES COUNTY.

Variety.	Acres in Trees.			
	Bearing.	Non-Bearing.	Total.	Plant of 1892.
Apple.....	882	629	1,511	99
Apricot.....	1,774	1,125	2,899	333
Cherry.....	18		18	
Fig.....	549	424	973	119
Olive.....	415	373	788	233
Peach.....	2,191	1,868	4,059	720
Nectarine.....	30	6	36	5
Prune.....	1,724	1,701	3,425	902
Pear.....	778	883	1,661	352
Plum.....	147	160	307	92
Quince.....	16		16	
Lemon.....	556	1,217	1,773	696
Orange.....	7,387	4,910	12,297	3,352
Nuts—Almond.....	57	50	107	50
Walnut.....	1,752	3,779	5,531	1,269
Chestnut.....	6		6	
Raisins.....	671		671	
Table grapes.....	1,182		1,182	
Small fruits.....	331		331	
Totals.....	20,472	17,122	37,594	8,724

MARIN COUNTY.

Marin County is a peninsula separated from San Francisco by the Golden Gate, and approaching within a mile and a half of the latter county at its nearest point. It is surrounded on three sides by water—on the east by San Pablo and San Francisco Bays, on the south by the Golden Gate and the Pacific Ocean, and on the west by the Pacific Ocean. Sonoma forms its northern boundary. Altogether Marin possesses a longer coast-line than any other county in the State. Its area is 509 square miles, or 325,000 acres.

The topographical features of the county are rolling hills and numerous small valleys. A part of the Coast Range crosses Marin in a north-westerly and southeasterly direction, and much of the surface of the county is broken and hilly, and a considerable portion immediately on the shore is composed of marsh and overflowed lands. The highest land in the county is Mount Tamalpais, which has an elevation of 2,608 feet.

Marin County has two distinct climates, which may be named the coast and inland climates. Between these there is a remarkable difference, and one that can hardly be realized when it is understood that they are separated from each other by a low mountain range scarcely 3 miles across. On the ocean side of this range fogs, chilling winds, and disagreeable weather are common, while on the inland side sunshine, warmth, and spring-like salubrity prevails.

On the inland side is San Rafael, the county seat of Marin, which enjoys climatic advantages unsurpassed in the State. Its nearness to San Francisco is apt to interfere with a just appreciation of its advantages in this respect, as those who are unacquainted with the facts cannot believe that there can be so great a difference in the climate of two places so near together. Its range of temperature is not great, the air is dry, and during nine months in the year there is little if any wind. During March, April, and May there are occasional heavy winds.

Following is a summary of the weather at San Rafael for one year, from observations taken at 2 P. M. daily:

Month.	Mean Temp.	Clear Days.	Cloudy Days.	Rainfall.
June	74	29	1	.00
July	79	30	1	.00
August	76	28	3	.00
September	74	28	2	.00
October	70	28	3	1.29
November	65	19	11	1.08
December	52	5	26	11.43
January	52	23	8	11.81
February	57	16	12	3.20
March	56	11	20	4.97
April	65	20	10	2.45
May	69	23	8	.62
Totals.....	66	260	105	36.85

The following table of average rainfall, compiled from observations covering a series of years, will show the difference in precipitation at various points in Marin County, and also the months of the year in which rain is likely to occur. These tables of average rainfall do not give an idea of the number of clear months in the year, as they do rainfall in June and September, when there are many years in which no rain falls in those months, and some in which May and October are dry. The rainy season is included in the months of November and April:

	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Point Benito...	4.96	4.59	3.83	2.76	1.05	.48	.00	.00	.31	1.61	2.76	3.04
Point Reyes...	3.38	3.15	2.62	2.04	.65	.28	.00	.00	.04	.54	2.09	2.77
San Rafael...	9.77	6.29	6.05	3.77	1.34	.47	.00	.00	.39	2.59	4.52	4.39

The soil of Marin County varies from the rich adobe clay of the salt marshes, to the sharp, gravelly loam of the higher foothills. In the valleys it is composed of heavy black loam with an admixture of gravel; in the foothills a reddish loam prevails, sharper, and carrying less adobe. It is all easily worked, heavily charged with the elemental constituents of plant life, admirably suited to horticultural purposes, and wherever worked to fruit yields heavily.

Irrigation is not required. The depth of the soil, its retentive nature, and ample rainfall in the winter months, render artificial watering unnecessary.

The principal industry of Marin County is dairying, but of late years much attention has been paid to fruit growing, and large areas of land have been set to orchards. Some of the finest apples grown in the State are produced in Marin County. On the dairy lands of the Novato Ranch there are 10 orchards. On every rented subdivision of this, and the Burdell Ranch, they are growing apple, pear, quince, fig, pomegranate, persimmon, apricot, peach, plum, and other fruit trees, the thrifty growth and large yield from which proves the superior adaptability of the soil and climate of this portion of Marin County to fruit growing.

On the Novato Ranch, the property of Hon. Frank C. DeLong, is one of the largest fruit orchards, including one of the oldest and most celebrated apple orchards, in the State. This orchard contains 250 acres, with 40,000 trees, of which 22,000 are apple, 2,000 apricot, 3,500 pear, and the remainder mixed fruits, including peaches, plums, cherries, English walnuts, almonds, and figs. There are also 200 acres of vineyard planted to Mission and Zinfandel grapes. The fruit from this ranch suitable for canning is taken by the Petaluma Canning Company. The apples are carefully sorted, and the best are packed in boxes and shipped to Australia, where they obtain the highest price, the reputation of this orchard being established at the antipodes. The smaller apples are used for cider and vinegar. Berries are grown to some extent and have proved profitable.

The land in Marin County is generally held in large tracts, and rented out for dairying purposes. It is very profitable in this way, and as a result there is but a sparse population, and but little advance is made in horticulture, although the greater part of the county is eminently fitted for this industry.

The DeLong orchard is the oldest fruit farm in Marin County. It was planted in 1857, and has been in continuous bearing from the beginning. No extensive amount of planting has been done in Marin County during the past year. The crop outlook of this year is quite short. Apples will not return over one fourth the usual yield, pears not over half; peaches and apricots are reported average.

ACREAGE AND VARIETY OF FRUITS IN MARIN COUNTY.

Variety.	Acres in Trees.			
	Bearing.	Non-Bearing.	Total.	Plant of 1892.
Apple	470	16	486	5
Apricot	50	21	71	8
Cherry	12	3	15	1
Fig		3	3	1
Olive		1	1	
Peach	50	40	90	20
Prune	12	34	46	7
Pear	40	20	60	8
Orange		2	2	
Nuts—Almond	2		2	
Walnut		1	1	
Totals	636	141	777	50

On this area there are some 12,000 trees not yet in bearing, the remainder being in old orchards.

The chief fruit section of Marin is around Novato, although there are numbers of young orchards distributed over the county.

MARIPOSA COUNTY.

Mariposa County is triangular in shape, and is bounded on the north by Tuolumne County, on the south and east by Fresno County, and on the west by Merced County. Its area is 1,543 square miles, or 988,000 acres, mostly mountains and foothills. The county reaches eastward from the edge of the San Joaquin Plains across the foothills far into the Sierra Nevada Mountains, its altitude varying from 300 to 13,000 feet, Mount Dana, the highest point of land in the county, reaching an elevation of 13,227 feet.

The topographical peculiarities of Mariposa County strongly resemble those of El Dorado, Amador, and Calaveras. With its eastern extremities lying in the high Sierra, and its western portions embraced in the San Joaquin Valley, it is at once a mining and agricultural district. Its forests, too, are so extensive that lumber can be put down as its third important industry.

The Merced River and the waters of the Mariposa both take their rise in this county, the first by the time it joins the San Joaquin being quite an important stream. On the south the Chowchilla River forms the boundary between this and Fresno County, while numerous smaller streams flow westward into Merced County.

The county is scenically remarkable for containing the Yosemite Valley, which has been so fully described and illustrated that neither time nor space need be devoted to it here.

What has been said of the climate of other mountain counties will apply to Mariposa. In the higher altitudes the winters are characterized by almost arctic severity, while in the foothill region but little severe weather is known. In the summer the thermometer frequently reaches beyond the 100° mark, but usually the days are comfortable, the nights cool, and the whole salubrious.

The foothill soil of Mariposa is usually a sharp, red admixture of

adobe and gravel, while in the valley regions a black alluvium is common. Much of it is a sharp decomposed granite, which works easily and is very fertile.

Mariposa is devoted more to mining than to horticulture, although of late considerable attention has been bestowed upon fruit culture. The diversified climate, varying all the way from semi-tropical near the edge of the plains to temperate on the higher foothills, produces all kinds of fruit, from oranges and citrons to apples and pears, according to the location. Some of the best apples that find their way to the San Francisco market are produced in Mariposa County. An orchard of 1,500 trees planted by James Lannon in the Yosemite Valley has been bearing for years and with good results. The fruit is very large and handsome in appearance and the yield abundant.

The agricultural and fruit interests of the county are steadily improving; thousands of acres are taken up by settlers every year, and there is yet considerable valuable land left for new-comers. Fruit raising promises to be a very important industry. None of the foothill counties, which are now rapidly showing their superiority over the rest of the State in this important department, have any advantage over Mariposa in soil, climate, or quality of production.

The orchards of Mariposa County are principally family orchards. P. P. & C. L. Mast have lately gone into fruit growing on a more extensive scale, and have 140 acres in orchard and vineyard at Coulterville. The trees are not yet in bearing, but they have made an excellent growth, and give promise of acting as the pioneers of more extensive plantings hereafter. Ninety acres of this orchard were planted last winter, the remainder the year previous.

The principal fruit sections of this county are Coulterville, Jerseydale, Darrah, and Grant Springs, and the fruits which prevail are apples, pears, prunes, plums, peaches, and berries, being given in order of importance. The output for 1891 was: apples, 7,000 boxes; pears, 500 boxes; of other fruits no record was kept.

The prospects for this season are not bright for a large yield. A late frost, general over the greater part of the State, visited Mariposa in blooming time, and as a result, except in the more sheltered nooks, the apple crop will not average over half the usual yield.

The oldest orchards in the county are those of Daniel Hutzell, August Olney, William Curtis, and J. Lindsey. In the Curtis orchard are apples and peach trees and vines, planted as early as 1856 by one Demarant.

There are no irrigation works in Mariposa. Where irrigation is resorted to it is the work of individuals. The water is taken by private ditches from the streams and used on the lands of the ditch owners. One of the most complete systems is that owned by P. P. & C. L. Mast, for watering their 140-acre orchard at Coulterville. This is an earthen reservoir 50x150 feet and 5 feet deep, which was constructed in 1890 at a cost of \$150. Speaking of his method of irrigating, Mr. Mast writes:

"I have a dam in the Merced River, made in 1867 by the miners; from it is a ditch extending 2½ miles, at which point I have 26 feet fall, which runs a 13½-inch Leffel wheel; it propels one of Garrat's triple plunger pumps, No. 6½, and raises from 3,000 to 5,000 gallons an hour, 120 feet vertical, in a pipe-line 700 feet long (3½-inch pipe). This irri-

gates my whole plant, except about 450 olive trees and a few almond trees, which are irrigated by another unimportant ditch."

Following is the total number of miles and value of ditches, mining and irrigating, in Mariposa County:

	Miles.	Value.
Irrigating ditches	22	\$1,030
Mining ditches	94 $\frac{1}{4}$	5,390
Totals	116 $\frac{1}{4}$	\$6,420

Thomas Davery, speaking of the vicinity of Darrah, says:

"We are at an altitude of 3,100 feet, with a southerly exposure. All of the fruit named grows to perfection, and all mature well; free from pests at present. In our locality the apple is a wonder, and the king of fruits, especially late kinds. Yellow Newtown Pippin and Lawver are the best here, and will keep sound and solid from November to July. The Easter Beurré pear keeps with us from November to March, and is a delicious pear. The Bartlett is a great yielder, and of the very best quality. Pears, peaches, prunes on peach roots, and grapes, grow here without water, with thorough cultivation."

ACREAGE AND VARIETY OF FRUITS IN MARIPOSA COUNTY.

Variety.	Acres in Trees.			Plant of 1892.
	Bearing.	Non-Bearing.	Total.	
Apple	115	50	165	20
Apricot	15	3	18	1
Cherry	10	5	15	2
Fig	14	5	19	1
Olive	15	15	30	5
Peach	12	8	20	2
Nectarine		4	4	
Prune	10	15	25	10
Pear	20	8	28	2
Plum		2	2	
Lemon		10	10	3
Orange	20	8	28	2
Nuts—Almond	14	8	22	5
Walnut	8	4	12	1
Other nuts		4	4	
Raisins	40		40	
Table grapes	120		120	
Small fruits	2		2	
Totals	415	149	564	54

MENDOCINO COUNTY.

Mendocino County is bounded on the north by Humboldt and Trinity Counties, on the east by Tehama, Glenn, and Lake Counties, on the south by Sonoma County, and on the west by the Pacific Ocean. Its area is 3,780 square miles, or 2,000,000 acres. It has 100 miles of coastline. In general topography it is a mountainous county, with valleys lying between the mountain chains, or along the coast. It is one of the three great northern counties—Humboldt and Trinity being the others—

that embody the greater part of the northern Coast Range Mountains, taking in their highest peaks, their deepest cañons, their fertile valleys, wooded slopes, rushing rivers, and picturesque scenery. Mendocino County shares with Sonoma, Humboldt, and Del Norte the glory of the great redwood belt of the world.

From north to south, this county has a length of 85 miles. Its width east and west is 45 miles. The Coast Range of mountains, composed of two parallel ridges, traverses the central portion of the county for its entire length. These mountains vary in height from 1,000 to 3,000 feet. Their lower slopes have a gentle declivity, while the higher portions are generally precipitous and furrowed with ravines and gulches. In the eastern and northern portions of the county many small productive valleys are found.

The Eel River, running north, and the Russian River, running south, both have their source in this county, and are the principal streams. A large number of tributaries connect with them, while down the slope of the western ridge large numbers of creeks, some of which might aspire to the dignity of rivers, find their way to the Pacific. It will be seen that Mendocino is well watered with the numerous streams which take their rise in the mountain chain that intersect her territory.

The climate of Mendocino County varies with altitude and proximity to the ocean. On the immediate coast heavy fogs and strong winds are common, while the interior valleys escape these to a large extent, and the extreme heat of the summer months is very greatly modified by their influence. During the summer the thermometer will reach the 100° mark and occasionally touch 10° beyond, but this is unusual. Like other portions of the coast, the heat is not oppressive, and work can be prosecuted without extreme discomfort even during the hottest days. In the winter there are occasional frosty nights and mornings, and in exposed situations the mercury will sometimes, though not often, fall 20° above, and it is recorded that on one occasion in Round Valley it fell as low as 17°. The temperature will give a mean of 80° for summer and 40° for winter. The rainfall is in excess of that of most of the counties of California, averaging 31.50 inches per annum. The following table, prepared by George McCowen, D.D.S., of Ukiah, gives a very accurate account of the precipitation at that point from 1877 to 1891, inclusive:

Year.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Total.
1877	7.38	4.70	2.14	.59	.35	.00	.00	.00	.00	1.50	4.58	3.59	24.83
1878	19.03	17.24	7.60	1.27	.27	.00	.00	.00	1.05	3.70	.00	.68	60.84
1879	4.44	6.17	14.47	3.36	2.56	.00	.00	.12	.60	.87	5.92	10.08	38.59
1880	5.03	2.17	4.45	11.78	1.84	.00	.00	.00	.00	.00	.15	12.27	38.19
1881	10.25	4.96	.70	1.80	.80	.00	.00	.00	.22	1.00	1.00	6.72	25.95
1882	3.41	5.87	4.06	1.92	.50	.00	.00	.00	.73	2.70	3.95	2.88	26.02
1883	2.88	1.25	3.62	5.21	2.71	.00	.00	.00	1.15	1.85	.64	1.31	20.62
1884	4.12	3.52	5.43	5.16	.43	1.01	.00	.01	.40	.76	.17	12.94	34.73
1885	2.51	1.91	.25	.43	.36	.14	.00	.00	.15	.53	19.11	5.43	30.72
1886	9.74	.23	2.96	6.43	.98	.00	.00	.00	.00	1.27	.86	4.43	26.90
1887	2.56	7.85	1.74	3.21	.41	.00	.00	.00	.30	.00	1.52	4.89	24.48
1888	10.29	2.07	3.87	.10	.23	2.13	.18	.00	1.51	.00	4.04	7.48	41.80
1889	1.04	.84	9.94	1.36	4.25	.15	.00	.00	.00	8.05	4.17	15.63	45.48
1890	14.74	5.00	9.47	2.56	.86	.00	.00	.49	.05	.20	.480		38.17
1891	2.13	10.38	2.44	2.59	1.10	.32	.28	.00	1.00	4.00	.88	.00	22.12
Av'ge.	6.64	4.92	4.87	3.14	1.28	.26	.03	.09	.54	1.66	3.55	6.65	-----

From the above table it will be seen that the heaviest rainfall is in December, January, February, and March; that only four years in the fifteen was there rain in June, one year it rained in July, and two years in August.

Taken by seasons, the rainfall has been:

	Inches.		Inches.
1877-78.....	55.08	1884-85.....	20.87
1878-79.....	26.43	1885-86.....	45.59
1879-80.....	32.36	1886-87.....	22.33
1880-81.....	29.63	1887-88.....	35.78
1881-82.....	24.70	1888-89.....	30.66
1882-83.....	25.94	1889-90.....	60.48
1883-84.....	24.41	1890-91.....	23.08
Average rainfall per season.....			31.50

The land upheaval which formed the Coast Range, left between two of the mountain chains a string of lakes which are, in their geographical position as you travel to the north, the valleys known now as Sonoma, Sanel, Ukiah, and Redwood Valleys. Although the formation of these lakes is a matter of geographical history, their conversion into valleys is a matter of recent history. The erosion from the surrounding mountains filled these lakes with a deposit at a very early date after their creation; but the erosion has been deposited to such an extent during the last few years that the large trees situated at the bottom are in nearly every case buried many feet above their roots. If one will consider the original formation of these valleys, and will at the same time keep in mind what the mixture of certain soils will be when the natural chemical reactions have taken place, he will have no trouble in seeing in his mind the nature of the soils in Mendocino's valleys.

The land upheaval left the various strata of rocks, which are found in all out-croppings. The erosion from the mountains washed down into the valleys and, mixed with decayed vegetation of the country, made a loam deposit which is very thick, varying from 2 feet near the foot of the mountains to 30 feet in the middle of the valley. The soil which adjoins the loam deposit is what is known as black gravelly loam, mixed to a more or less extent with adobe.

Which of the two soils is the stronger is difficult to decide. The loam will produce more corn, while the black land will produce more and better fruit. Both will produce large crops of grain, but one will do about as well as the other.

Next back from the black soil is the hill land. The quality is uniformly thick brown soil, which is lighter than the other two and drier. This last described soil is little cultivated at present, save in a few instances.

In Ukiah Valley there is the greatest variety of soil on even a small tract. The river, and the many small streams which come from the mountains, have deposited sand, gravel, or alluvium. Speaking in a general way, there is a band of sandy loam along the banks of the river and larger creeks. Lying back of this and a little lower is a broad band of clay loam, very rich, but a little too rich for the best results. Rising still farther back is a sloping bench running to the hills, and oftener of light, yellow clay, and formerly heavily covered with brush. In some places this bench is deeply covered with coarse gravel. The lower hillsides are clayey and timbered. There are some large bodies

of a black gravel formed by mountain streams, and this black gravel is the finest fruit land.

All of the best lands are under cultivation, and the benches will soon be cleared and tilled. Holdings are not large, 200 acres of valley land being an exceptional farm, and the tendency is to subdivision.

The soil in Yorkville Valley is a rich, black loam, and well adapted to the growing of vegetables, fruits, grains, and hops. The soil of the hillsides and mountains is well suited to the growing of grass, vines, and fruits, and some places grain.

Anderson Valley is a long, narrow strip of land lying between two chains of mountains. It extends 17 miles southeast and northwest, and is from 1 to 2 miles in width. The soil in this valley is rich alluvial, and well adapted to the growing of vegetables, fruit, and cereals. The soil of the hills is a rich, black loam, except in a few places where will be found adobe and gravel.

In Potter Valley the soil is mostly a sedimentary deposit, but a variety exists—some clay, a small amount of adobe, and some of the lands so famous in other parts of the State for fruit raising.

In Little Lake Valley the soil generally is a rich, sandy loam, but in a few places a black loam is found. The soil is very productive, and pays the tillers a liberal reward for their labors. Never in the history of the valley has there been anything approaching a failure.

On the subject of horticulture in Mendocino, Carl Purdy furnishes the following able article to the Ukiah "Republican Press:"

"Family orchards were put out by many of the early settlers of the county, and are still in bearing and vigorous. Lack of transportation and a limited home market were, for many years, drawbacks to any developments of the fruit business. Our small orchards everywhere over the county, in valley and on hillsides, in the redwood forest and on the coast, served to test the adaptability of soil and climate. It can be said that the apple and pear do well anywhere, the quality, however, being better in the redwood belt; that the peach and nectarine produce fruit of good quality in all but the immediate coast section, but that, except in a few favored spots, the certainty of yield and healthfulness of trees are not such as to induce planting to compete with such favored localities as the Sacramento Valley and the Tulare region; that the apricot is a total failure in nearly every place; that the plum and prune thrive and yield as nowhere else in California, and the Bartlett pear is of superior quality and productiveness; that small fruits have not been tested properly, but there is little reason to hope that they can be grown at all, at least not profitably. Olive trees are to be seen in many places in Ukiah and Sanel Valleys, but have not yet reached a fruiting age. In some of the warmer valleys figs thrive, while all through the southern portion of the county grapes grow as well as in Sonoma or Napa Counties.

"The great diversity of climate between the valleys on Russian River, the redwood region, the immediate coast, and the elevated valleys on Eel River, makes it impossible to treat the fruit business of the county as a whole. Outside of these variations there are differences in elevation and exposure to air currents which make small localities in each section altogether different from the surrounding country, as well as cause considerable diversity in sections that a casual judgment would pronounce uniform. The business of fruit growing in Mendocino County, to be

presented successfully, demands a close study of all local conditions of elevation and air currents, as well as soil and moisture. I will now proceed to treat of the various belts and localities of the county.

"Those valleys lying on Russian River—Sanel, Ukiah, Redwood, and Potter, with smaller valleys or coves opening into them—have a very similar climate, and no great difference in altitude or amount of fog, excepting that Potter Valley lies higher, and is more subject to the cooling influence of the San Hedrin range.

"The first person to plant fruit largely was N. Wagonseller, at Ukiah, who commenced in 1873, and put out some 36 acres. Mr. Wagonseller was compelled to gain experience for himself, and planted and tested a great number of varieties, many of which were not successful. He planted plums and pears largely, and for a number of years made the drying of plums for the city market successful, and was even able to ship pears profitably, with the haul to Cloverdale by wagon. These experiments did much to show the adaptability of this section for plums and pears, and to indicate the direction which the industry would take. In 1873 and 1876 others began to plant prunes largely, R. McGarvey and D. P. Cowsert, at Ukiah, and the Clay Ranch, at Sanel, being among the first good-sized prune orchards planted.

"It is now conceded that this section produces prunes of exceptional size and quality, and that being less juicy they are more profitable to the buyer—at least 16 per cent. Prunes are being planted constantly, and now a fresh impetus is given to the business. The large hop kilns can be used as driers, saving the erection of others. There are now in Ukiah Valley about 200 acres of prunes; in Sanel, about 75 acres; in Potter, 40 acres, and probably 25 acres in Redwood Valley. The Bartlett pear is another fruit to which attention is being drawn, and about 125 acres are to be found in the three valleys. Plums do wonderfully well, but the dried fruit sells poorly. Apples of very good quality are produced, the yield being very heavy.

"The Thomas Bros., in Redwood, have made a great success in raising peaches for the home market, and many are grown all through the section, although not as a market fruit. Nectarines grow well, but apricots are a failure. Figs do well in some places, while on all of the upper slopes grapes do as well as could be asked. Messrs. Myers at Hopland, Gobbi at Ukiah, and Peters, Seward, and Morrow at Calpella, have fine vineyards, and are said by good judges to produce fine wine.

"Sanel Valley has great advantages for fruit growing, and is building up fast. Conditions in Ukiah are much the same. The land in Redwood Valley is not so rich, and held at much lower rates, and many new settlers have bought small tracts for fruit growing. In Potter Valley interest is awakening, and many prunes are being planted.

"In speaking of fruit growing in the section along the coast, I feel some diffidence, for I have not the information, either as to acreage or the industry itself, to write it up as thoroughly as I would wish, or to do justice to the section. All along the coast from Gualala to Bear Harbor orchards are to be seen, varying from a few dozen trees to 5 acres. In this statement I do not include those orchards lying back a few miles, for climatic conditions are altogether different, and I have already spoken of them under another head. For successful fruit growing on the immediate coast some shelter is necessary from the winds, and orchards are either planted in protected situations, or wind-breaks are used.

With such protection as this, excellent apples and pears are grown, as well as some plums and cherries, while if we think of small fruits—strawberries, blackberries, raspberries, currants, and gooseberries—they grow so readily and bear so well as to be hardly an object. All varieties of apples ripen much later than in the interior valleys, are more acid and crisp, and of finer flavor. Pears are also very good. Few orchards are planted as a business proposition, but few of the farms are without some trees, and more are being planted every year. A few miles back, either on the ridges or sheltered clearings, there is reason to suppose that fruit could be raised very profitably.

"There is a belt of country running through Mendocino County from north to south, including Yorkville, Anderson, Christine, Comptche, and other small valleys, lying within the limits of the redwood forest; the climate is much tempered summer and winter by the influence of the fogs from the ocean, from which they are distant by air line only 6 to 15 miles. This belt of country does not contain a very large quantity of tillable land, Anderson Valley being the most extensive, and it may be said of it that wherever a fruit tree can be planted it will thrive.

"All of the deciduous fruits, excepting apricots, do exceedingly well, but the one thing in which this region excels is the apple. Not only are the apples of this section beautiful in appearance and large in size, but they possess as fine a flavor as any that grow in North America. This is due to the cooling influence of the fog, which in most of these places keeps the summer temperature well down. The trees are exceptionally thrifty and bear very heavily. I have seen orchards bearing fine fruit without the least cultivation, and even single neglected trees in fence corners or pastures that were doing well. The early settlers planted many trees, perhaps as much from force of habit as otherwise, for in those days the market was distant and transportation difficult.

"The coast section has furnished a market for a great deal of fruit. Some has been brought to Ukiah and Cloverdale, and even been shipped to the city, where the fine quality causes a remunerative price to be received. The section around Comptche, where Mr. Hoak and others have fine orchards, finds a ready market for its fruit at Mendocino City, the distance being about 17 miles. There is also some fruit shipped through the latter port to San Francisco. Up the country are several fine orchards at different points, from 5 to 15 miles from the coast, and these orchards have a good outlet for their products over the wagon roads of that section. It may be said, however, that if dependence is placed on the local markets only, the limit of the development of the fruit industry has been reached. Its further extension would depend on one of two things: first, cheap transportation; second, drying the fruit.

"With cheap transportation these fine apples will find a good market anywhere in California, and at paying prices. Anderson Valley, in which I would include all of that section from Yorkville to Christine, may have cheap transportation in the near future. An extension of the road up the Navarro River only a few miles would bring it to the lower end of Anderson Valley, and give a cheap route by water to the city. Hopes are also entertained of a railroad to Russian River Valley, crossing the low divide, to the headwaters of the Navarro. Such a road will doubtless be built, but the scheme is altogether too indefinite as to time to justify one in basing a business proposition upon it. The people of

Anderson Valley are acting more wisely, for by the erection of numerous driers they have solved the problem of marketing their fruit. Lumber, fine redwood too, is to be had at \$8 to \$10 at the mills, which are in the very edge of the valley. Labor is reasonable. These facts permit the erection of a drier at the cost of \$100 to \$500, which will handle the fruit of a small orchard to perfection. Every orchardist can have his own drier. Wood is very cheap; to be had for the cutting. These driers easily handle the product of 5 to 15 acres of old orchard. Fruit is bought of neighbors and dried, and it can be said truly that none goes to waste. The finest drier is that of J. D. Ball, near Boonville, with a capacity of several tons of green fruit per day. The evaporated apples are readily bringing 8 cents per pound in this season of depressed prices.

"Land fit for apples is held at very reasonable rates, and at current prices the residents can well afford to plant. A great impetus has been given to the fruit growing of the section, and much is being put out. I have spoken of apples, not because the climate of this section is only adapted to this fruit, but because they have so many advantages that good sense would dictate paying special attention to their culture. Prunes do well here, and orchards of from 5 to 20 acres are being put out every season. Prunes will rank second in the fruit development of this section. Peaches, pears, and plums do splendidly. Grapes only thrive in warm situations.

"In leaving this section we would say that its future in fruit growing is very bright, and with quick and cheap transportation it will surely boom.

"All along the road from Ukiah to Mendocino City, on that long ridge, small orchards are being planted. The rugged nature of the country makes large plantations impossible, but for these small growers we can offer only encouragement, for the beautiful fruit they produce will always find a paying market, even if it has to be hauled 15 or 20 miles, and this isolation is a protection from insect foes."

The principal fruit sections of Mendocino County are Ukiah, Potter, Little Lake, and Anderson Valleys. In these, pears and prunes are the favorite fruit in Ukiah; apples, pears, and prunes in Potter Valley; apples and prunes in Little Lake and Anderson. Probably the oldest orchard is that owned by John Mewhinney and planted by his father, Samuel Mewhinney, in 1859. This is principally of apples, the stock having been procured in Sonoma County.

The principal markets for Mendocino fruit are local and San Francisco, the greater part of that shipped being packed in boxes and forwarded to the San Francisco market.

The exports of different sections for 1891, as reported, were:

	Tons.		Tons.
Anderson	500	Comptche	60
Little Lake	100	Caspar	7
Pomo	4	Christine	250
Ukiah	55		
Whitesboro	48	Total	1,024

Reports of the condition of the present season's crop from most districts of this county are generally light. Apples from one half to two thirds of the crop; pears, three fourths; peaches and plums, about one half of the usual average.

ACREAGE AND VARIETY OF FRUITS IN MENDOCINO COUNTY.

Variety.	Acres in Trees.			
	Bearing.	Non-Bearing.	Total.	Plant of 1892.
Apple	536	60	596	10
Apricot		3	3	
Cherry	10	7	17	1
Fig		1	1	
Olive	2		2	
Peach	47	50	97	12
Nectarine	15	25	40	6
Prune	121	447	568	127
Pear	80	30	110	12
Plum	25	10	35	3
Orange		1	1	
Nuts—Almond	3	2	5	1
Raisins	7		7	
Table grapes	14		14	
Small fruits	9	4	13	3
Totals	869	640	1,509	175

The planting for the present season has been light, over 90 per cent of the total acreage being in old orchards.

Irrigation is resorted to to a very limited extent, a few private ditches being taken from the natural watercourses. There are no irrigation companies or districts.

MERCED COUNTY.

Merced County is in the heart of the great San Joaquin Valley, and is centrally located in the State, being almost equi-distant between the northern and southern boundary lines. It is bounded on the north by Stanislaus, on the west by Santa Clara and San Benito, and on the south by Fresno County. The greater part of its extent, which is about 90 miles east and west and 40 miles north and south, comprising an area of 1,968 square miles, or 1,115,336 acres, lies directly in the San Joaquin, across which it extends from the foothills of the Sierra Nevada range on the east to the summit of the Coast Range on the west. In the northeastern portion of the county there are high foothills, increasing in height as they approach the higher lands of Mariposa County, where they merge into the high Sierra. On the southwest is the Coast Range, with rugged steppes, abrupt cañons, fertile valleys, and hills sloping to the plain, in the lower part of which lies the San Joaquin River.

With the exception of this small portion of the eastern part of the county, and that situated on the eastern slope of the Coast Range, the county is almost a level plain, broken only by watercourses.

The San Joaquin River passes in a northerly and southerly direction almost through the heart of the county. There are no precipitous banks to the river in this county, and during the high waters it frequently overflows its banks, inundating the adjoining country for a distance of some 3 miles on either side, twice each year. To the west of the San Joaquin River are the rolling, picturesque foothills of the Coast Range.

A large number of creeks take their rise in the mountain ranges on either side of the valley. Most of these are torrents in the winter, only to become dry beds in the summer. Some find their way into the plains.

and, where not diverted for irrigating purposes, become lost in the sand. Among the principal streams on the east side are the Chowchilla River, Bear, Black Rascal, Dry, Mariposa, Dead Man, Mills, Owens, and Dutchman Creeks; on the west side are San Luis, Quinto, Los Baños, Cottonwood, Sycamore, and Wild Cat Creeks. The principal stream, however, is the Merced River, which, having its source in Mariposa County, in the Yosemite Valley, runs the greater part of its course through Merced, flowing through the entire length of the county, and reaching the San Joaquin on its western border.

On the eastern side of the San Joaquin are the bottom lands and plain lands, skirted on the east by a narrow strip of low foothills, adapted to some classes of horticultural industry. The Merced River bottom has an average width of 3 miles, with an abrupt bluff on each side, and the soil here is found exceedingly fertile.

The climate of Merced differs little from its sister counties of the San Joaquin Valley. The summer months are hot, not usually oppressively so, although occasional days in the heated term are too hot for absolute comfort, although not too hot for fruit drying, at which season they usually come. Frost is infrequent. The mercury will, in the winter, sometimes drop as low as 25° in some portions, but so low a temperature is the exception. This extreme low temperature may be expected in January, but never in any other month. The extreme heat in the summer occurs in July and August, when, for a few days in succession, the mercury may rise to 108° in the shade in the middle of the day. On account of the very great dryness of the atmosphere, the most extreme heat in the summer does not interfere with any farm or outdoor work. The rainy season commences anywhere from October to December, and usually when not raining the weather is clear. Snow sometimes falls in the higher foothills, but not frequently. Fogs are not common, and occur mostly in November and December.

The following table gives the rainfall at Merced City for the ten years from 1877 to 1887:

	Inches.		Inches.
1877-78.....	13.77	1882-83.....	10.40
1878-79.....	6.82	1883-84.....	23.13
1879-80.....	12.80	1884-85.....	8.40
1880-81.....	11.87	1885-86.....	18.34
1881-82.....	9.73	1886-87.....	6.74
Average rainfall for ten years.....			12.20

The rainfall for the past four years is given by months, as follows:

	1888-89.	1889-90.	1890-91.	1891-92.
September.....	.60	.00	1.99	.00
October.....	.00	2.30	.00	.00
November.....	3.13	4.45	.17	.21
December.....	2.38	6.03	2.02	4.07
January.....	.50	4.87	.51	.34
February.....	.33	1.62	2.84	1.06
March.....	2.30	1.16	1.54	2.33
April.....	.26	.49	1.34	1.05
May.....	1.00	.78	.00	2.44
Totals.....	10.50	21.70	10.41	11.50

The soil of Merced varies with the locality. There are the alluvial lands of the bottom, a heavy reddish adobe loam, mixed with gravel, a lighter chocolate-colored loam, containing much gravel and sand, and a very sandy loam. The alluvial bottom land soil occurs over a large body of land in the southern as well as in the western part of the district. It is a comparatively late deposit from the Merced River, Bear Creek, and other smaller streams, dark gray in appearance, easy to work, and does not bake after irrigation; it is the soil for gardens and grapevines. This alluvial soil is also easily irrigated, and holds the water well, and everything planted in it grows quickly.

The heavy adobe-like loam is a direct wash from the foothills, and is principally found at their base. The color of this soil is dark brown, like chocolate, and it turns darker yet when irrigated. It contains a great deal of iron, and is rich in all constituents which promote plant life. When properly moist, and not too wet, it plows and cultivates well and readily, and pulverizes to a beautiful loam. This soil is the favorite soil for the orange, not only because it is a rich soil and contains much gravel, but principally on account of its location along the base of the hills, the very place where the thermal belt reigns supreme. This soil is also eminently suited for olives, and must as such be considered as the olive soil. Old olive trees grown in this soil are yearly loaded with fruit.

The third variety of soil is the very dark, blackish-red chocolate loam, very similar to the best of other soils of this character. It differs from this, however, in being more reddish, and it contains much iron. Like the adobe soils, it hardens if left alone after irrigation, but pulverizes readily if plowed or cultivated in time. As to location, this soil is also found at the base of the hills. Geologically considered, it is of older formation than the alluvial soils; in quality it is equal to the best soils anywhere.

A fourth variety is a light, sandy loam, easily worked and irrigated, which holds moisture well, and which abounds in soluble plant-food ready for the immediate use of the trees.

Like most of the land in the San Joaquin Valley, irrigation is an absolute necessity over the larger portion of Merced County in the production of fruits and summer crops, and the county possesses one of the greatest irrigation works in the State in the Crocker-Huffman Canal. This was owned by the Merced Canal and Irrigation Company, the principal stockholders in which were C. H. Huffman, of Merced, and Charles Crocker, of San Francisco. The capital stock of the company was \$2,000,000. Operations were conducted by the company until April, 1888, when it was reincorporated under the name of the Crocker-Huffman Land and Water Company, with a capital stock of \$3,000,000. Mr. Huffman has had actual charge of the work of construction, and the work is considered one of the finest on the Pacific Coast. The design was to run the canal from the point of inlet, near Merced Falls, across the country to Plainsburg, some 10 miles southeast of Merced City, on the Southern Pacific Railroad. And it was so surveyed as to maintain as high an elevation along the edge of the foothills as possible, thereby securing a supply to as large an area of land as was compatible with the necessary fall required to maintain the current. The entire length of the canal so planned, from the point of diversion to the Chowchilla River, is now 50 miles. This, however, does not properly represent the

work done, as there are some 150 miles of lateral or subsidiary canals now built as part of this system, and these are constantly being added to as demand requires. The main canal was made 60 to 75 feet wide at the bottom, 100 feet wide on top, and 10 feet deep, the carrying capacity being thus about 4,000 cubic feet per second.

In the engineering part of the work, among the vast difficulties encountered during its progress not the least was the cutting through of two tunnels, one of which, with its approaches, was 5,000 feet in length, and the other 3,500 feet. These are 22 feet wide and 12 feet high, with a fall of 14 feet to the mile. One was blasted through solid rock, mostly, while the other presented equal difficulties, by reason of its soft formation, and necessitated the use of some million and a quarter feet of supporting timbers. Blasting had also to be largely resorted to in the cutting of a large portion of the way through cement gravel, which is as difficult of removal as rock, and which was met with to a great extent on the line of the canal. Lake Yosemite, into which the water from the canal empties, is an artificial reservoir, from which water is taken to supply the city of Merced, as well as for irrigation, the water being conveyed to the city in iron pipes.

To carry out this stupendous project was a heavy contract to undertake, and many predictions of ultimate failure were periodically made, but nevertheless it was pushed boldly to completion. A dam 4,000 feet in length was constructed of cement, gravel, and earth, and of sufficient thickness to give perfect security against breakage, being 275 feet wide at the base, 20 feet wide on top, and 60 feet high, and along the crest runs a smooth road, from which a splendid view of the lake and its immediate surroundings is obtained.

This name was given to Lake Yosemite because its waters, coming through the canal, originally emanated from the Yosemite Valley by the way of the Merced River. The superficial area of the lake is upwards of a square mile, and the average depth is 30 feet. This reservoir was constructed at a cost of \$200,000, and as much more was expended in continuing the work for the water-supply system of and to Merced City, including some 3,000 tons of cast-iron pipes, hydrants, laying pipes, etc. The main pipe leading the water from the reservoir to the city is 16 inches in diameter, while the distributing pipes vary from 6 to 8 inches. The reservoir has an elevation of 90 feet above the level of the railroad track at Merced, and, as double hydrants are used in the city, a fire can be quenched in any building in the city by direct pressure, without the use of steam engines. The formal opening of the canal was made the occasion, during 1888, of a grand demonstration, and the ceremony of turning in the water to the lake was participated in by some five or six thousand people, including many from abroad. The Governor of the State and many officials, representatives of the railroad company, were among those who graced the event by their presence. The people generally were full of rejoicing at the exercises. The two men whose enterprise and capital had made success possible were present to witness the happy result of their labors, and Charles Crocker turned on the water for the first time into the reservoir.

The entire cost of the canal and waterworks plant was \$2,000,000, and that much more was expended in the purchase of land contiguous to the line of the system. The company owned all of the equipment made necessary for construction of the plant, and had about 500 mules at

work. The force of men employed at one time was 700, while the number was always large. Owing to the personal attention given to the details of the work by the President, good work was the rule and result at every point. Besides supplying an abundance of water for city purposes, the canal furnishes sufficient to irrigate over 600,000 acres of land. A large part of the land, though almost worthless without water, becomes very valuable with it. The principal object of the company now is the development of its own lands and those owned by others which come under its system, and to induce settlers to locate upon it. The canal portends a great future for this county. Already the effects are visible in a degree in the splendid results of such progress as has been made, but the beginning of an era of prosperity, which is certain to follow, is only in its infancy.

The enterprise which made the canal a success has been rewarded and will be more fully compensated hereafter, but the benefit derived by the promoters is insignificant compared to the good which will ultimately result to this county by reason of it. The Directors of the Crocker-Huffman Land and Water Company are: C. H. Huffman, President; Col. C. F. Crocker, Vice-President; W. H. Crocker, M. S. Huffman, and W. R. Huffman.

Besides the Crocker-Huffman Canal there are two other large irrigation systems in operation in Merced County, namely: the San Joaquin and Kings River Canal, and the Stevenson & Mitchell Canal. The Turlock Irrigation District will also extend its irrigation system over the northwestern boundary of the county.

The Stevenson & Mitchell Canal Company take their water from the San Joaquin River, in Sec. 6, T. 9 S., R. 12 E., M. D. M. No dam is necessary, because the level of the river during a great portion of the year is higher than the level of the surrounding country. The canal runs in a northwesterly direction for about 20 miles, irrigating about 50,000 acres of land. The canal, where it leaves the river, diverts about 500 cubic feet of water per second.

The San Joaquin and Kings River Canal system, which irrigates upward of 30,000 acres in Merced and adjoining counties, has been in operation since 1872, it being incorporated under the name of the San Joaquin and Kings River Canal in September, 1871. It takes its water from the San Joaquin, near the mouth of Fresno Slough, in Fresno County. Probably about twenty sections have been irrigated by this system in Merced County during the last season.

It is proposed to extend lateral canals from the canal of the Turlock Irrigation District throughout a portion of the territory lying between the Merced River and the boundary line between Merced and Stanislaus Counties. The area irrigated by this means will extend in an easterly direction nearly to Delhi Station, on the Central Pacific Railroad, and westerly almost to the San Joaquin River. The Turlock Irrigation District, organized under the Wright law, lies in both Stanislaus and Merced Counties, the largest area being in the former county.

In the southern portion of the county artesian water is obtained, some at very shallow depths. The artesian area within which flowing wells have been obtained extends throughout the county from a southeasterly to a northwesterly direction upon either side of the San Joaquin River. This area may, roughly speaking, be said to be bounded upon the north-east by the main line of the Central Pacific Railroad, and upon the

southeast by a line about one mile northeast of the San Joaquin and Kings River Canal.

The strata from which flowing water is obtained are found beneath a stratum of blue clay, which is struck at a depth of from 100 to 200 feet upon the eastern side of the area described, and from 200 to 300 feet upon the western side. Upon the western side of the valley this stratum of blue clay does not appear to rise; indeed, as has been already observed, it lies much deeper than upon the eastern side of the San Joaquin River.

The shallowest flowing wells are upon the eastern edge of the artesian area, but they yield the least amount of water; as the center of the valley is approached a greater depth has to be attained, but the flows are stronger.

The strong flow of artesian water continues upon the west side of the San Joaquin River to within two miles of its western limit; at that point the hydrostatic pressure which afforded strong flowing wells nearer to the San Joaquin, owing to the rise in the surface of the ground, is only able to yield a weaker flow. The identity of the water-bearing strata is evidenced by the fact that when receding westward from the point of strongest flow, the relative strength of the flow from borings of similar depth is inversely proportional to the superficial elevation. Toward the eastern limit of this artesian area, flowing water can be obtained at a depth of 128 feet, but in no great volume, the water only just flowing over the edge of the casing at the surface of the ground.

IRRIGATION WORKS IN MERCED COUNTY.

Name.	Miles.	Assessed Value.
San Joaquin and Kings River Canal and Irrigation Company-----	38	\$76,000
Crocker-Huffman—main canal-----	20 $\frac{3}{4}$	52,187
Crocker-Huffman—branches-----	12 $\frac{3}{4}$	14,850
East Side Canal Company-----	17 $\frac{1}{2}$	8,750
Totals-----	88 $\frac{3}{4}$	\$151,787

With the soil, water, and climate so nicely adjusted by nature to the wants of the fruit grower, the only wonder is that more progress has not been made in the culture of fruits. However, much has been done in various sections to fully demonstrate the assertion that fruit culture in Merced County is a success, as is evidenced by the large acreage on the Merced River. The Rotterdam Colony has some 1,500 acres growing fruit trees; the Hooper Colony has some hundreds more; the Buhach, the Dean, and numerous other colonies have hundreds of acres successfully planted to various deciduous fruits.

The cereal and large wheat era in the history of Merced is now giving way to horticulture. The vast Crocker-Huffman property about Merced City, covering many thousands of acres of exceedingly fertile land, is being settled by small farmers, and a splendid beginning has been made toward the development of the horticultural capabilities of this section. An admirable illustration of what can be accomplished by perseverance on these vast plains is seen on the famous Buhach Ranch, near Atwater, a few miles north of Merced. This ranch was, but a few years since, a piece of grain and pasture land, worth but a few dollars an acre. Water was

brought to it, however, and a commencement made. A large area of wine, table, and raisin grapes was planted, together with apricots, peaches, almonds, pears, and other fruits. Peaches and apricots thrive in the various colonies about Merced. It may truthfully be said that for deciduous fruits these lands are quite equal to any in the State, producing fruit that is second to none grown elsewhere.

Prunes and plums thrive equally well on some of the lands, there being no fruit more profitable or desirable to the horticulturist, as California is the only place in the United States where prunes can be successfully and profitably grown where the fruit can be dried in the sun, thereby giving to us, as it were, a monopoly on this branch of horticulture.

Pears thrive unusually well on the moist, heavy lands, and prove to be a very profitable crop. The pears grown here have a very fine flavor, and for beauty cannot be surpassed, paying handsome returns to the growers of this luscious fruit, which is produced to perfection on the soils above mentioned.

The raising of olives is one of the most promising industries here. Of all trees thus far planted, and there are many out, only good results are heard. In one plantation on the Rotterdam Colony alone, there are about 160 acres planted that are doing magnificently. Gustav Eisen, in speaking of the olive in Merced, says: "Our soil, climate, and other conditions are exceedingly favorable to the culture of the olive, the most noble of all fruits known to man."

The orange will thrive best in the thermal belt of the Sierra Nevada foothills, and the nearer to the mountains the better the locality is adapted to citrus culture. This is accounted for by climatic influences, the soil being the same as in the valley proper. Nevertheless, the orange grows in and about Merced City. Some eight years ago, Mr. Atwater planted eighteen orange trees, and the vigor with which they grew, and the prolificness with which they fruited, led him to extend his cultivation of these fruits. Three years ago he set out 11 acres, just to the north of his residence, to orange and lemon trees, and skirted the outside of the citrus fruit with olives. The orange trees are of four varieties, budded stock, as follows: Parson Brown, Jaffa, Mediterranean Sweet, and Washington Navel. The lemons, of which he has two hundred and fifty trees, are of the Villa Franca variety. His olive trees number about three hundred and fifty, and are of the Mission variety.

The principal fruit sections of Merced County are Merced, Snelling, Merced Falls, Atwater, and Turlock.

Merced's principal industry in the past has been the growing of cereals, and it is only within the past few years, and especially since the completion of the Crocker-Huffman Canal, that any attention has been paid to fruit growing on a commercial scale. Of late years, however, a number of important colonies have been located in this county. Several of these, composed of Hollanders, are in existence here, and are in a very prosperous condition.

Fruit of various kinds thrives well, the favorite varieties being apples, apricots, peaches, plums, grapes, and berries. No large amount has as yet found its way to market, as the orchards are usually young and the trees have not come into full bearing. That which is shipped out of

the county, however, finds a ready market in Stockton, Sacramento, and San Francisco.

ACREAGE AND VARIETY OF FRUITS IN MERCED COUNTY.

Variety.	Acres in Trees.			
	Bearing.	Non-Bearing.	Total.	Plant of 1892.
Apple.....	30	4	34	2
Apricot.....	23	12	35	3
Cherry.....	2	2	4	1
Fig.....	39	130	169	46
Olive.....	3	297	300	70
Peach.....	164	259	423	89
Prune.....	13	135	148	57
Pear.....	31	56	87	20
Lemon.....	1	4	5	2
Orange.....	6	46	52	12
Nuts—Almond.....	8	57	65	23
Walnut.....	7	7	14	1
Chestnut.....	4		4	
Raisins.....	1,160		1,160	
Table grapes.....	465		465	
Totals.....	1,956	1,009	2,965	326

MODOC COUNTY.

Modoc County lies in the extreme northeastern part of the State, and is bounded on the east by the State of Nevada, on the north by Oregon, on the south by Lassen, and on the west by Siskiyou County, and has an area of 4,296 square miles, or 2,700,000 acres. The topography of this county is a succession of mountain ranges and valleys, and is principally drained by Pitt River, which has its outlet in the bay of San Francisco. The lava-bed section, at the northeastern corner of the county, is a succession of gulches and crevasses, which range from a few feet to 100 feet in width, and many of them are 100 feet deep; some have subterranean passages which lead for miles under the rocks. This broken country extends in a belt eastward to Goose Lake. This lava section of the county has no arable lands, and it is fit only for grazing purposes. It is a vast plain of table-land, and in some places it is sparsely covered with juniper.

The valleys referred to as forming part of its topography are a very important feature. Surprise Valley lies in the extreme east, lengthwise north and south, and includes in its eastern portion three lakes, varying in length from 15 to 20 miles, and from 3 to 5 miles in width. These lakes have no outlet. The valley is about 60 miles long and 15 miles wide, and is skirted on two sides by lofty, timbered mountains. It is watered by numerous streams. Goose Lake Valley lies mostly on the eastern side of Modoc Lake (which is 30 miles long and 15 miles wide, extending into Oregon on the north), and is watered by numerous small streams. On the west side of the lake there is a narrow strip of valley. Big, or Round Valley, on Pitt River, in the southwestern portion, and reaching into Lassen County, is 30 miles long and 18 miles wide.

The soil of Surprise Valley is a rich, black loam. This valley is partly under cultivation, wheat, barley, hay, fruit, and vegetables being the staples. Dairying is also carried on to a considerable extent. Goose

Lake Valley is covered with bunch and other grasses, and boasts of some good, improved farms. The soil of Big, or Round Valley, is varied in character, from red to dark loam. Within the valley are several creeks, the rich bottom lands of which are, to some extent, under cultivation. Stock raising is the principal industry. There are many places in the mountains now used for grazing, which are well watered by springs and small streams, and, having a deep, rich soil, are suitable for general farming purposes.

On the foothills is found what is known as "bunch-grass land," a sedimentary deposit easily worked and very fertile.

The climate is that of the temperate zone, but the winters are much milder than in the Eastern States. Snow falls in the valleys and on the mountains, but does not lie long in the valleys. Stock will live through the winter without feeding, but it is always profitable to feed stock during the winter months. Occasionally the mercury will reach zero in the winter, and sometimes touch 100° in the summer, but these are extremes. The average monthly rainfall, as recorded at Fort Babbitt and Fort Bidwell, is given below:

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Fort Babbitt.....	1.63	.68	2.24	.31	.20	.18	.08	.10	.21	.25	2.75	3.17
Fort Bidwell.....	4.15	2.71	2.19	1.57	1.33	1.00	.27	.21	.38	1.04	1.99	3.22

The county is well watered, and but little irrigation is done. Pitt River, which has its source in this county, aided by numerous smaller streams, furnishes water for all purposes, while springs are numerous over the greater part of the county. In the valleys excellent water can be procured by boring to a depth of from 6 to 30 feet.

Horticulture has but a small place in Modoc County as yet, the principal industry so far being stock raising. While, however, a comparatively large area of the county is worthless for agricultural purposes, there is a great deal of territory which, under proper cultivation, might be made profitable in fruit. The greatest drawback to this industry is the remoteness of Modoc from markets and its lack of railroad facilities. As it is there are a number of orchards of various kinds of fruit. Surprise Valley, 25 miles northeast of Alturas, has several excellent orchards, and large quantities of very fine apples are grown here; peaches, pears, and cherries do well, and in the vicinity of Goose Lake an abundance of wild plums is found. Strawberries and other berries thrive here, and if transportation facilities are ever afforded it, Modoc will take her place among the other fruit counties of California.

The soil of Modoc County is largely a sandy loam with occasional patches of adobe, very largely intermixed with volcanic tufa and lava. The whole country is of volcanic origin, and in most parts very forbidding and unfit for agriculture. There are, however, a great many fertile valleys scattered through the county, at present used for stock and grazing purposes.

The fruit industry has as yet made no great headway, the orchards being small family patches. Where trees have been planted and properly cared for, they have done well and the yield of fruit is generally large. The quality, especially of apples and the more hardy varieties,

suited to this climate, is very excellent. The principal sections where fruit is grown are Goose Lake, Surprise Valley, Hot Springs Valley, and Big Valley, and the area in these will amount to about 280 acres, distributed as follows:

	Acres.
Goose Lake.....	100
Surprise Valley.....	100
Hot Springs Valley.....	20
Big Valley.....	10
Scattering.....	50
Total.....	280

The principal varieties of fruit grown here are apples, pears, plums, cherries, and berries. In some places peaches do well, but are not recommended for this locality. There has been no new land set to orchards in Modoc County, and those found here are generally old and in full bearing. The greater part of those now in existence were planted between 1864 and 1870. George Wimer, of Surprise Valley, Mrs. Godfrey, of Cedarville, and Mr. McDaniels, of Lake City, have the oldest orchards in the county. The stock was procured from Reno in Nevada.

Irrigation is resorted to on a small scale, the ranchers owning their own ditches. There are no large irrigating companies in this county. In July of the present year, some farmers organized an irrigating company on what is known as the "West Side." This company was incorporated under the name of "Bull Run Irrigation Company," with R. A. Ricketts as President and R. E. Paulk as Secretary. This is the first irrigation company organized in Big Valley, and probably will be the means of further irrigation development in this section.

Big Valley is a very large and fertile body of land, capable of yielding large returns in cereals and fruits, if properly cultivated, with the aid of irrigation. It is at present used almost wholly for stock grazing. There are numerous streams in this county from which water can be diverted. Among them are the Pitt River, and Bidwell, Soldier, Cedar, Mills, Eagle, Owl, Cottonwood, Goose, Emerson, Silver, New Pine, Cottonwood No. 2, Willow, Lassen, Davis, Franklin, Joseph, and Tom's Creeks. These are merely small streams fed from the snows of winter. The snowfall will average about 15 inches in the valley, and from 10 to 15 feet on the mountains.

The nearest railroad point to Alturas, the county seat of Modoc County, is Amedee, which is 135 miles distant. The road is very rough and rocky over a large part of it, which makes the transportation of fruit from Modoc County to railroad points almost impracticable. Therefore, very little has been shipped outside of the county.

Last year H. L. Spargur, of Surprise Valley, shipped about 1,000 pounds of apples, which found their way to the San Francisco market, and this formed the bulk of fruit exported from the county.

The yield last year was very large, but Modoc, in common with the rest of California, was visited by a late frost last spring while the trees were in bloom, and, as a result, the apple crop this season will not exceed half the usual amount. Other fruits will also fall short, but they were not so severely injured as were the apples.

The output of various fruits in this county in 1891, from estimates furnished by Mr. Emery Null, was as follows:

	Tons.		Tons.
Apples.....	10	Prunes.....	5
Pears.....	3	Quinces.....	1½
Peaches.....	8		
Apricots.....	2½	Total.....	33
Plums.....	3		

ACREAGE AND VARIETY OF FRUITS IN MODOC COUNTY.

	Acres in Trees.		Acres in Trees.
Apple.....	210	Pear.....	25
Apricot.....	6	Plum.....	10
Cherry.....	3	Quince.....	2
Peach.....	14		
Prune.....	10	Total.....	280

MONO COUNTY.

Mono County is a long, narrow county, its greatest length bordering on the State of Nevada, which forms its northeastern boundary. On the south it is bounded by Inyo, and on the west by Fresno, Mariposa, and Tuolumne, and on the northwest by Alpine County. It has an area of 2,796 square miles, or 1,790,000 acres, of which all but 400 square miles are mountains.

The western portion of the county lies among the Sierra Nevada Mountains, the heights being clad in snow, and the slopes of the range being covered with forest trees. Among the highest peaks in the county are Mount Dana, 13,627 feet high; Mount Lyell, 13,217 feet high, and Castle Peak, 13,000 feet high. The eastern portion of the county, which is usually spoken of as a strange, mysterious country, is of a desert-like, volcanic character, abounding in salt pools, alkali, and volcanic table-lands, the characteristics of this portion of the county being significantly indicated by some of the local names, such as Hot Springs, Geysers, Sulphur Springs, Black Lake, Soda Pond, Volcanoes, Obsidian Mountain, Deep Cañon, Volcanic Table-Land, Red Crater, Adobe Meadow, and Oasis. Mono Lake, situated in the center of the county, is about 15 miles long by 10 miles wide, its waters being a somewhat unusual compound, various chemical substances being found in solution in them. This lake has the appearance of having once been the scene of volcanic action; the country surrounding it, as Bodie, Aurora, and Benton, abounding in minerals. A number of volcanic cones, having extinct craters, lie to the south of the lake, and a great portion of the formation of the district may be considered volcanic; debris consisting of porphyry, granite, limestone, and a remarkably pure obsidian, and deposits of lava are found at Aurora and Table Mountain. The fires of the ancient volcanoes may not yet be all extinct, for upon the islands in the center of the lake jets of hot vapor escape, and there are a number of boiling springs of water. The great bluffs and rocky ravines of the Sierra come almost to the western shore of the lake, while upon the western side salt deposits and lines of drift-wood mark the plain, showing very distinctly what were the former more extensive shores of this sheet of water. Upon the bluffs of the western side are water marks, which make it seem highly probable that the waters were once almost a thousand feet above their present elevation, spreading out over the plains to the east to form a great inland sea. The lake receives a number of small streams, but is without a perceptible outlet. Owens River in the south, which takes its rise in a high peak in the Sierra, Mount Kitten, and Walkers River in the north,

being the principal streams in the county, the one passing through the southern part of the county into Inyo, the other continuing its course, after rising in Mono, to the State of Nevada.

Mono County being situated on the eastern slope of the Sierra, and the larger portion of it in the high mountain regions, has a climate totally different from that of the western slope, and resembles more that of the Eastern States than that of California. In the higher altitudes the summer days are pleasant, although in the lower valleys the mercury will rise well toward 100° occasionally. The winters are characterized by heavy snowfalls and severe frosts.

The valley soil of Mono is formed by erosion from the mountains, and is to a great extent sedimentary, with alluvium. A great deal is barren and sandy, and great tracts of alkali are found. There is, however, a considerable amount of fertile land, which, by the aid of irrigation, can be made productive, and already much has been brought under cultivation by this means. Cereals do not attain that perfection of growth so desirable, partly from the extreme altitude of the county, and partly from the rigors of the climate, attendant to some extent thereupon.

Mono County has, however, a considerable cultivable area; much of it is very rich and fertile. This lies mostly in the western part of the county. Among the richest of her agricultural lands may be classed Bridgeport Valley, or Bridgeport Meadows, as it is frequently called; Antelope Valley, Long Valley, and the famous Adobe Meadows in the vicinity of Mono Lake. There is also a large amount of rolling foothill country admirably adapted to grazing.

The altitude and physical characteristics of the county do not favor horticulture, and but little fruit is grown. However, there are a few favored localities where fruit trees under proper care do well. Of the different kinds of fruit grown in this county, J. H. Connell, of Coleville, reports the varieties as follows:

Apple: Early Harvest, Red Astrachan, Red June, Alexander, White Winter Pearmain, Fall Pippin, Yellow Bellflower, Spitzenberg.

Peach: Governor Garland, Briggs' Red May, Hale's Early, Early Crawford, Late Crawford, Susquehanna, Stump the World, Foster, Morris White, Salway, Lemon Cling, Twenty-ounce Cling.

Pear: Bartlett, Winter Nelis, Madeline.

Cherry: Royal Ann.

Plum: Bradshaw, Green Gage, Washington, Columbia, Damson, Peach, Cherry.

Quince: Portugal, Orange.

Currant: Cherry.

Strauberry: Captain Jack, Sharpless, Monarch of the West, Park Beauty, James Vick.

As stated above, Mono cannot be classed as a fruit-growing county. It is situated high in the Sierra Nevada range, and its altitude, topography, and climate, except in a few favored localities, preclude the successful cultivation of orchard trees.

Mining is here the principal industry, lumbering following in order, fruit growing holding a very inferior position.

Very little is done in the line of irrigation, and there are no irrigation works in existence in the county. There is one mining ditch reported,

that of the Mono Virginia Creek Hydraulic Mining Company, having a length of 5 miles, and an assessed value of \$16,000.

The bulk of the fruit raised in the county is grown in the immediate vicinity of Mono Lake, and the principal fruit is berries. The soil, generally, is very rocky, and there is not an orchard in the county of over 5 acres in extent.

The following are the principal orchards in the county and are located at Coleville, and for the present comprise about the extent of the industry:

J. F. Owens	5 acres.
John H. Connell	2 acres.
William Radler	2 acres.
J. L. C. Sherwin (Bishop Creek)	2 acres.

MONTEREY COUNTY.

Monterey County is bounded on the north by Santa Cruz County and Monterey Bay, on the east by the counties of San Benito, Fresno, and Tulare, on the south by San Luis Obispo County, and on the west by the Pacific Ocean. It covers an area of 3,328 square miles, or 2,300,000 acres. Monterey County is about 100 miles south of San Francisco, between parallels 35° 45' and 37° north latitude, and is 80 miles in length by 45 miles in width. Owing to the peculiar topographical character of the county, with its rough mountains and broad plains, gently rounded hills and fruitful valleys, it has a great diversity of soil, climate, and productions, making it, for purposes of settlement, one of the most desirable regions in the State. The county is divided into three sections—the mountains and hills on the east, the mountains and hills on the west, and the great Salinas Valley, situated between the ranges of mountains, and opening upon Monterey Bay at the north. The Salinas Valley extends south from Monterey Bay over 100 miles, and is from 5 to 15 miles wide.

The Gabilan range has a length of 75 miles and a breadth of 20 miles, forming a barrier between Monterey and San Benito Counties. Gabilan Peak, near the south end of the chain, is 3,381 feet above the sea, and Mount Cholame, 35 miles to the southeast, is 3,800 feet. This range extends from the Pajaro River on the north in a southeasterly direction throughout the entire length of the county. From the Pajaro River, going south, the first 18 miles of the range is a system of low mountains and small valleys, covered almost everywhere with grass and timber. The next 30 miles of the chain is composed of high, rough mountains, worn into deep and precipitous cañons, and covered with low chemisal. From the San Lorenzo to the southern boundary of the county these mountains are low, rolling hills, interspersed with numerous beautiful little valleys, among which are Peach Tree, Cholame, Indian, Long, Priest, and several others, all possessing a rich soil and a delightful climate.

The Santa Lucia Mountains extend from Carmel Bay, in an unbroken line southeast bordering the coast, as far as San Luis Obispo; then trending to the east and merging into the main Monte Diablo range. They are a rugged mass, with an average breadth of 18 miles, and over 5,000 feet in elevation at the highest point. The western portion of the range is particularly abrupt and inaccessible.

The Salinas River, after flowing through San Luis Obispo County,

enters Monterey County a few miles north of the old Mission of San Miguel, nearly in the center of the southern border of the county. The Salinas River is the third in length in the State flowing into the Pacific Ocean. Its principal tributaries are the San Lorenzo and Estrella from the east, and the Arroyo Seco, San Antonio, and Nacimiento from the west. The Arroyo Seco empties into the Salinas about 30 miles southeast of Salinas City. About 18 miles up the stream the valley assumes the character of a cañon and leads back into the mountains in a southerly direction, heading away up in the Santa Lucia range. The Carmel is a beautiful stream of water, draining the hilly country north and east of the northern termination of the Santa Lucia Mountains. Its outlet is Carmelo Bay. San José Creek rises in the Santa Lucia Mountains, runs north and empties into the Carmelo. It is a noted stream for trout fishing. The Big and Little Sur Rivers have their sources in the same chain of mountains and flow westward into the Pacific Ocean. Elkhorn Slough is in the northern part of the county and runs westerly into the estuary of the Salinas River. The San Antonio and Nacimiento Rivers run throughout the upper part of their course in a direction opposite to that of the Salinas, or nearly in a southeast direction. For more than 30 miles they are nearly parallel, and 5 or 6 miles apart. The region between them is occupied by high ridges composed of bituminous slates, underlaid by sandstone.

The Salinas Valley, embraced by the Gabilan Mountains on the northwest and the Santa Lucia range on the southwest, opens out on Monterey Bay, and extends southward 100 miles, with an average width of 10 miles. Its area, therefore, is about 1,000 square miles, or 640,000 acres of land—almost an empire in itself. The Salinas River flows through the valley. The San Antonio hills stretch diagonally across the valley in two portions, the region above being a sort of table-land, of low, rolling hills, while below there is a valley, gradually opening out until, at Salinas City, it is 12 or 15 miles wide, and as fine a section for farming as any in the State. The lands of this valley may be divided into three classes:

First—The heavy, rich bottom lands, which will grow almost anything. The soil is mostly black adobe, and frequently contains just enough sand to make it work easily.

Second—The table-lands, which are particularly well adapted to growing wheat, barley, and other cereals, the average yield of wheat being about 30 bushels, and of barley about 50 bushels per acre.

Third—The uplands. Some of this land is the best fruit land in California, and will produce oranges, lemons, grapes, peaches, apricots, almonds, figs, apples, plums, berries, and other fruits common to this section.

The Pajaro Valley extends from the shore of Monterey Bay to the foot of the Gabilan Mountains, a distance of about 10 miles, ranging from 6 to 8 miles in width. The land is exceedingly fertile and under a high state of cultivation, producing immense crops of all kinds of grain, fruits, and vegetables. Well-tilled farms greet the eye, and villages, school houses, churches, and picturesque residences dot the landscape whichever way one turns. The foothills are covered with flocks and herds, and the lower ranges are timbered with live oak and madrona. The Pajaro River runs westerly through the valley, and finds an outlet in Monterey Bay.

The Carmel Valley lies 5 or 6 miles south of Monterey. The soil is very fertile, and the products of the valley are vegetables, grain, fruits, and berries.

Besides the valleys just described, there are numerous other small valleys in the county, among which may be mentioned San Antonio, Hames, and Sapaque Valleys.

Monterey Bay is about 30 miles wide, and circular in form. Point Pinos forms its southern and Point New Year its northern headland. Carmelo Bay is about 4 miles south of the town of Monterey. It is 4 miles in length and 2 miles in width, and has deep water, but is exposed to south and southwest winds. Cypress Point is situated at the northern entrance of Carmelo Bay, and is one of the grandest spots on the coast. The dark cypress trees, from which the point was named over three hundred years ago, cover the headland and skirt the water's edge. Point Lobos juts out into the ocean at the southern extremity of Carmelo Bay. Point Sur is situated about 25 miles south of Monterey. The Sur River enters the ocean a little south of the point.

The climate of Monterey is very equable on the coast, the heat of summer being modified by the ocean breezes. In the interior it is much more variable, and during the summer months hot days are frequent. Violent and often unpleasant winds are unknown. A trade wind, or modified land and sea breeze, prevails most of the year. During the summer months this is moist, often with a sea fog. The cañons and little valleys of the mountainous districts have their temperature modified by these winds, and are unexcelled in their climatic conditions.

The average rainfall, in a record of seventeen years, has been about 13.50 inches, only once during these years so small as to greatly injure the industries dependent upon it. The rainless months are July, August, and September, while December, January, and February are the rainy months. Artesian wells, trade winds, and pumps can at all times be made to furnish an abundance of water for every purpose, except grain raising, and the water is excellent for irrigation.

The following table shows the rainfall at Salinas City for the past seventeen years; it was prepared by Dr. E. K. Abbott, of the United States Signal Service:

	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April.	May.	June.	Total.
1872-3	0.00	0.00	0.01	0.02	0.02	6.80	3.40	2.40	0.80	0.00	0.00	0.00	13.45
1873-4	0.00	0.00	0.10	0.10	0.20	4.25	3.42	0.00	2.15	0.95	0.00	0.00	11.17
1874-5	0.00	0.00	0.00	1.83	1.42	0.00	4.50	0.15	0.69	0.00	0.00	0.00	8.59
1875-6	0.00	0.00	0.00	0.00	5.17	2.18	6.16	3.55	4.52	0.00	0.01	0.00	21.59
1876-7	0.10	0.00	0.05	1.04	0.05	0.00	2.54	0.16	0.30	0.10	0.40	0.00	4.74
1877-8	0.00	0.00	0.00	0.12	1.00	2.39	7.05	8.77	2.57	1.93	0.00	0.00	23.82
1878-9	0.00	0.00	0.05	0.60	0.20	0.35	2.42	2.81	1.85	1.69	0.82	0.15	10.94
1879-80	0.00	0.00	0.00	1.05	1.08	2.28	1.65	1.16	1.64	3.90	0.46	0.00	13.22
1880-1	0.00	0.00	0.00	0.00	0.57	5.56	3.32	2.32	1.26	0.66	0.00	0.38	14.07
1881-2	0.00	0.00	0.10	0.28	0.67	1.24	1.78	2.31	4.86	1.01	0.49	0.19	12.93
1882-3	0.00	0.00	0.38	1.43	0.65	1.95	0.91	0.65	2.26	1.28	1.98	0.00	11.79
1883-4	0.00	0.00	0.19	1.19	0.25	0.90	1.71	4.49	5.09	3.05	0.72	2.66	20.25
1884-5	0.00	0.18	0.11	1.79	0.28	4.46	1.09	0.05	0.19	1.21	0.12	0.00	9.48
1885-6	0.00	0.00	0.02	0.08	0.82	0.72	0.75	4.73	0.54	1.63	0.07	0.00	9.88
1886-7	0.00	0.00	0.00	0.62	0.82	2.16	4.15	0.53	3.28	0.00	0.89	0.00	12.70
1887-8	0.00	0.00	0.71	0.00	0.98	2.16	4.15	0.53	3.28	0.00	0.89	0.00	11.63
1888-9	0.00	0.00	0.56	0.00	1.64	2.20	0.64	1.65	3.31	0.95	0.68	0.00	15.51
1889-90	0.00	0.00	0.00	4.20	2.41	8.90	-----	-----	-----	-----	-----	-----	-----

The temperature for five years, from the same authority, is given as follows:

	1885.	1886.	1887.	1888.	1889.
January—					
Highest.....	69.5	68.0	70.0	63.0	64.0
Lowest.....	33.0	29.0	28.5	44.8	27.5
Mean.....	48.7	49.2	46.9	64.0	44.6
February—					
Highest.....	75.0	73.0	72.5	74.5	*
Lowest.....	32.0	37.5	29.0	35.0	*
Mean.....	50.3	52.6	43.8	50.3	*
March—					
Highest.....	82.5	67.5	81.5	70.0	77.0
Lowest.....	36.0	35.0	33.0	30.0	43.0
Mean.....	55.1	49.2	52.1	50.0	54.9
April—					
Highest.....	81.5	74.8	70.0	79.0	76.0
Lowest.....	41.0	38.5	40.0	41.5	48.0
Mean.....	56.5	51.7	51.8	54.2	56.3
May—					
Highest.....	76.0	77.0	70.0	74.0	87.0
Lowest.....	49.5	49.0	44.0	51.0	49.5
Mean.....	57.9	57.2	54.3	57.0	57.1
June—					
Highest.....	73.0	71.0	78.0	75.0	75.0
Lowest.....	51.0	51.0	50.0	51.0	51.0
Mean.....	56.4	56.9	58.5	62.0	61.1
July—					
Highest.....	73.0	76.0	72.0	84.5	77.5
Lowest.....	54.0	52.0	43.0	54.0	53.0
Mean.....	61.4	58.9	56.9	61.4	59.5
August—					
Highest.....	75.5	78.0	70.0	76.5	75.0
Lowest.....	57.0	53.0	53.0	52.0	52.0
Mean.....	58.9	59.6	56.9	59.5	59.6
September—					
Highest.....	82.0	88.0	78.0	93.5	88.0
Lowest.....	47.0	46.5	47.0	47.0	48.0
Mean.....	58.9	58.5	58.1	59.6	60.1
October—					
Highest.....	72.0	69.0	91.5	82.5	94.0
Lowest.....	38.3	39.0	42.0	40.0	44.0
Mean.....	56.3	52.5	58.5	55.7	55.1
November—					
Highest.....	72.0	80.0	78.0	77.0	78.0
Lowest.....	30.0	31.0	28.0	31.0	38.0
Mean.....	52.7	49.2	51.9	55.6	54.2
December—					
Highest.....	74.0	77.5	66.5	67.0	65.0
Lowest.....	32.0	32.0	32.0	37.5	34.7
Mean.....	52.0	49.8	46.0	51.6	48.9

* Absent in the East.

Most semi-tropical fruits do well in some parts of Monterey County, as also do the principal varieties of the temperate zones. Apples, pears, plums, quinces, prunes, and cherries grow splendidly in the Salinas Valley, and, in fact, all over the county. Peaches and apricots arrive at great perfection in the foothills, cañons, and small valleys; while the fig does well in sheltered places. Many portions of the county seem adapted to oranges, lemons, and limes. At the present time the orange and lemon trees at Escolle's place, a few miles up the Salinas River, and at the Underwood farm, in the Corral de Tierra, are hanging full of excellent fruit. Olive trees flourish with all the vigor that they possess on the Mediterranean coast, and in many

localities almonds do exceedingly well. Currants, gooseberries, blackberries, and raspberries grow luxuriantly. Strawberries are in the market the year round. Grapes grow to perfection almost everywhere in the county except in the heavy bottom land of the Salinas Valley, and even there grapes are produced that it would be hard to beat. More attention is now being given to the planting of orchards and vineyards than heretofore. Thousands of fruit trees and vines have been set out during the past few years, and many of them are in bearing.

Experience gained in the varied climate of the county is gradually bringing about a policy of growing principally the varieties of fruit that long experience and careful trial have demonstrated best adapted to any particular locality. A large area of Monterey County has selected the apple and pear as the leading fruits for this locality. Prunes also do splendidly here. The San Miguel Cañon, Carneros, and numerous other valleys adjacent to the Gabilan and Coast Range of mountains, are known to be admirably adapted to the growing of grapes, peaches, apricots, and citrus fruits; while the great Salinas Valley, with its cool, moist, equable climate, has been demonstrated as one of the best localities in the State for growing the apple and pear. In the market, apples grown in this locality bring from 25 to 75 cents a box above average prices. Some apple orchards in the vicinity of Salinas bring in an income of over \$250 per acre, and larger returns are derived from cherries.

The chief fruits of Monterey County are apples, peaches, prunes, plums, pears, nectarines, almonds, and grapes, in order. There are a great many small growers scattered through the county, and nearly all cultivate small orchards to some extent, and with success. No attempt has yet been made to grow citrus fruits, except in a few instances, where an occasional orange tree has been planted. Olives have been tried to a limited extent, and so far, give promise of doing well. Mr. Hiram Westlake, of Jolon, has olive trees in bearing, and they yield very large returns.

There is a great deal of excellent land in this county adapted to deciduous fruits, especially apricots, peaches, prunes, and almonds.

The oldest orchards of the county are those at the old Missions. There was one of these at San Miguel of considerable extent, but nothing remains of it at the present time.

Nothing is done in the way of irrigation in Monterey County, except in a private way. Many of the ranchers and fruit growers rely upon surface and artesian wells and windmills for their water.

The principal fruit section is in the Salinas Valley, the soil of which is a deep, sandy loam, with occasional patches of adobe.

A shortage in fruits of all kinds is reported from Monterey, the average being from 25 to 30 per cent below that of ordinary years. Mr. A. McCusker, of Salinas, estimates the output of fruits in his district for 1891, at about \$3,000 in value. The local demand was not good, and there being no canneries in the county, a large amount of fruit and berries perished. There has been a small area of new fruit planted during the present year.

ACREAGE AND VARIETY OF FRUITS IN MONTEREY COUNTY.

Variety.	Acres in Trees.			
	Bearing.	Non-Bearing.	Total.	Plant of 1892.
Apple.....	249	101	350	35
Apricot.....	425	158	583	60
Cherry.....	18	10	28	5
Fig.....	7	10	17	3
Olive.....	42	10	52	2
Peach.....	150	26	176	12
Prune.....	566	520	1,086	150
Pear.....	85	16	101	7
Plum.....	21	9	30	2
Nuts—Almond.....	10	10	20	17
Walnut.....	7	16	23	4
Totals.....	1,580	886	2,466	297

NAPA COUNTY.

Napa County lies northeast from San Francisco about 40 miles, and is 70 miles southwest from Sacramento. It has an area of 789 square miles, or 450,000 acres, and is bounded on the north by Lake and Yolo Counties, on the east by Yolo and Solano Counties, on the south by Solano County and San Pablo Bay, and on the west by Sonoma County. Napa is one of the smallest counties in the State, but at the same time one of the most important. Its length is about 50 miles with a varying width of from 30 to 35 miles. Spurs of the Coast Range Mountains pass through it, most of which have a northerly trend. Between these spurs lie several rich and very productive valleys, where the soil is very rich, the climate congenial, and the scenery unsurpassed.

The western line of Napa passes along the ridge of a chain of mountains, the entire length of the county. East of this chain lies the beautiful Napa Valley, extending from Mount St. Helena at its northern end to San Pablo Bay on the south, and varying in width from 1 to 5 miles. The only valley of importance intersecting the slope on the western range, is Browns Valley, which lies northwest of Napa City, and is a lovely and productive little glen. White Sulphur Springs Creek, Dry Creek, and Carnero Creek flow down from these mountains, emptying into Napa River, a stream which extends the entire length of the valley and is navigable as far up as Napa City. The lower end of Napa Valley opens out fan-like to quite a wide expanse, and is low, flat tule land. Midway between the two extremes of Napa Valley and near its center from east to west is Yountville Hill. Mount St. Helena, at the head of the valley, rears its summit nearly 4,500 feet above the level of the sea. A chain of mountains extends along the entire length of the eastern side of Napa Valley, being broken by a few streams and cañons. Conn Valley is a small widening of the valley through which the creek of the same name passes.

In the eastern range of mountains there are some high peaks, such as Bald Peak, Atlas Peak, Howell Mountain, etc., ranging in height from 2,000 to 3,000 feet. The eastern and western ranges unite at the northern end of the county, Mount St. Helena forming the point of union. Over the Howell Mountain grade, at the east of Napa Valley, lie the broad

and fertile fields of Pope Valley, and over a low divide to the south of Pope is Chiles Valley; a high range of mountains on the eastern side of Pope and Chiles Valleys separates them from Berryessa Valley. This valley is drained by Putah Creek. Off the road from Napa to Berryessa are the small and lovely glens of Capelle, Gordon, and Wooden Valleys.

The climate of Napa will compare favorably with that of any of the interior counties. Its situation with regard to the bay and ocean is such as to yield it all the benefits to be derived from their proximity, while its interior position and mountain ranges deprive it of their discomforts. The rainfall averages so well that a shortage of crops is unknown. The influence of the ocean breeze is felt here during the summer months to an extent amply sufficient to temper the sun's heat, while the hills act as a barrier against the fogs. The foothills of Napa County are especially famed for their climatic features, and here are found some of the most noted health resorts in the State. In the thermal belt of the foothills is found a mild and equable climate the year round, and citrus and other sub-tropical fruits will grow there. In the spring the mornings are cool and bracing, the days bright and pleasant. During the summer the weather is warm, but the heat seldom becomes oppressive, the thermometer rarely registering higher than 90°. The rains of winter are interspersed with warm, sunny days. In the valleys during the winter months there are frequent frosty nights and sharp, cold mornings, but rarely sufficient frost to injure the fruit crop.

Following is a table of the average rainfall at Napa, Calistoga, and Knoxville, which gives a fair idea of the precipitation in this county:

	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Napa.....	5.88	3.87	3.61	2.98	.98	.27	.00	.00	.62	1.64	1.47	2.84
Knoxville.....	4.06	8.09	11.72	6.19	.16	.00	.00	.00	.00	1.92	.85	1.54
Calistoga.....	7.32	5.02	4.90	2.98	.90	.39	.00	.00	.29	2.22	2.85	4.41

The soil of Napa County may be divided into five classes. The first class, termed argillaceous, is common to the mountains on the east side of the county, and is not very productive. In Berryessa and Chiles Valleys there is a large percentage of this soil mixed with a rich loam, adapting these sections to grain growing. The second class, adobe, does not exist to any great extent, and is found only in spots in Berryessa, Pope, Chiles, and Browns Valleys. It is a stiff, cold, and disagreeable soil, not easily worked. The best soil is the loam, which may be found in all the valleys of the county, but principally in Napa. It is a rich alluvium, well adapted to all sorts of vegetable growth, and especially suited to fruit. Tule soil is found from Napa City southward, and along the margin of the bay. The last class is lava, a decomposed volcanic formation, and is excellent for vineyards. It is found in the vicinity of Howell Mountain.

Napa's great industry is in wine making, and her viticultural interests are greater than those of any other county in the State. Other branches of horticulture are followed, however, and with great success. The olive has been planted extensively upon hillsides which are almost useless for other fruits, and the tree thrives and promises to become a great source of wealth. Adolph Flamant planted here a large orchard for the Los Guillicos Olive Company some three years since. About one

third of the trees in the orchard are now in full bearing, and the whole orchard promises well. In speaking of the olive in Napa County, Mr. Flamant says: "The climate of Napa Valley and its surrounding sections is admirably suited to olive culture. It corresponds strikingly in its main features with that of the south of France and northern Italy, whence come the best imported pickled olives and olive oil. The olive tree needs a temperate climate, and dreads equally excessive cold or hot weather. It requires less labor and care than any other tree. It will grow to better advantage on high and stony land, comparatively useless for any other culture. There it will bear quicker and heavier than in a rich soil, its degrees of productiveness ranging from forty to a hundred gallons per tree, when the tree has reached its full development. It has been repeatedly demonstrated that in the exceptional soil and climate of California, and when planted with the one-year old rooted cuttings, it begins to bear when four years old. It enjoys an almost incredible longevity, since many modern travelers report having seen trees in Asia Minor which are over two thousand years old. Add to the above the simplicity and cheapness of the apparatus needed for oil making and olive pickling, the easiness of handling the crop, the rapidity with which it can be turned into a trade, as well as the cheapness of transportation of the product, considering its great value under a small volume, its immense consumption in all parts of the civilized world, and it will be easily conceived why olive culture is going to stand foremost among the industries of California."

Napa also produces deciduous fruits of all kinds, in quantity and quality equal to the best favored sections of the State. The prune especially does well here, and much attention has been paid to it of late. Apples and pears do well in all parts of the county, but make the best returns in the more elevated situations on the mountain slopes. Walnuts, almonds, apricots, peaches, cherries, and all the small fruits are raised to perfection, and without the aid of irrigation. While Napa makes no claim to superiority, or even to general adaptability to the growth of citrus fruits, yet there are many locations in the county where these thrive and yield good crops. All through Napa Valley, and especially in the foothill thermal belt, may be seen little orchards containing from half a dozen to several hundred trees, all of which are in as thrifty a condition as is possible, never having been attacked by the scale, and producing large crops of fruit, from 800 to 1,500 oranges having been gathered from a single tree.

At Calistoga the apricot does not do well in the valley, but with an elevation of several hundred feet does first rate. Oranges also do well under the same conditions. The fruits most profitably grown in this district are Royal apricots, peaches, and prunes.

The fruits chiefly recommended for planting in this district are: Petit d'Agen prune; Early and Late Crawford, Hale's Early, Susquehanna, Alexander, and Salway peaches; Royal apricot, Silver prune, and olives on the hills.

The chief fruit sections of Napa County are Calistoga, Browns Valley, Oak Knoll, and St. Helena. The favorite fruits, being those which are found to be best adapted to the soil and climate, are peaches, prunes, and plums, with occasionally some cherries. An experiment was made in citrus fruits, and three thousand orange trees were planted last season near St. Helena, which have so far done remarkably well.

The principal markets for the fruit of Napa County are found in San Francisco and San José, although during the past few years the cherry crop has found a market in the Eastern States. The fruit is mostly marketed green, and finds its way to the canneries, except prunes, which are dried. The present season's crop has been small, peaches running about two thirds, prunes one third, plums less than one third, and cherries two thirds of an average yield, while pears promise to give a full crop.

The oldest orchards in this county are the Suseal orchards, planted by Simpson Thompson in 1853. Most of the trees were imported from Rochester, N. Y., and from New Jersey, and comprised apples, cherries, peaches, pears, and prunes. This orchard now belongs to Mr. Allen, of San Francisco.

The orchard industry of Napa is second to the wine industry, Napa being one of the leading wine counties of the State. Wine grapes are grown very extensively in all parts of the county, and it is only of late years that much attention has been paid to orchard fruits; but the decline in the demand for, and prices of, wine has given an impetus to tree planting over that of vines, and during the last few years a very large area has been set to prunes, peaches, apricots, and other deciduous fruits.

Berries of all kinds also do well in this county, and yield very heavily. Mr. W. A. Truebody, who has a place some 7 miles north of Napa, says: "I have raised and marketed on my farm from 3 to 3½ tons of blackberries as an average crop, without irrigation." C. H. Starkweather, 2 miles north of Napa, states that he has netted \$112 from eleven Royal Ann cherry trees, \$26 from five prune trees, about \$350 per acre from currants, and \$125 per ton for table grapes. Prof. W. C. Damon, of Browns Valley, reports having cleared over \$200 per acre from Bartlett pears.

ACREAGE AND VARIETY OF FRUITS IN NAPA COUNTY.

Variety.	Acres in Trees.			
	Bearing.	Non-Bearing.	Total.	Plant of 1892.
Apple	215	46	261	12
Apricot	70	128	198	43
Cherry	140	120	260	40
Fig	10	13	23	5
Olive	43	62	105	21
Peach	527	318	845	105
Prune	311	816	1,127	234
Pear	200	86	286	33
Lemon	1	3	4	1
Orange	5	11	16	4
Nuts—Almond	27	50	77	12
Walnut	12	28	40	7
Table grapes	6		6	
Small fruits	12		12	
Totals	1,579	1,681	3,260	517

NEVADA COUNTY.

Nevada County is bounded on the north by Sierra and Yuba Counties, on the west by Sutter and Yuba Counties, on the south by Placer County, and on the east by the State of Nevada. It extends from the summit of the Sierra Nevada range, on the east line of the State, westward to the Sacramento Valley, a distance of 70 miles. It is from 12 to 20 miles in width. On its western line it has an elevation of about 1,000 feet, increasing to 2,000 or 3,000 feet in the central portion, and 8,000 feet along its eastern boundary. It has an area of 1,125 square miles, or 710,000 acres. Its natural boundaries are the South Yuba and Bear Rivers on the south, and the Middle Yuba River on the north. The general course of these rivers is from northeast to southwest, and through the northern and central portion it is partly divided by the South Yuba River, which unites with the Middle Yuba near the western boundary of the county, and forms the main river, which is a tributary of the Feather River. The western and middle portions of the county present a pleasing variety of landscapes in wooded hills, small valleys, or rolling uplands, a large part of which is well adapted to agriculture and grazing, and to the cultivation of orchards and vineyards. Along the extreme western boundary citrus fruits grow to perfection, as do the olive and other sub-tropical fruits, while through the central portion, in which are located Nevada City and Grass Valley, at an altitude of 2,500 feet, the Bartlett pear, and other fruits of the temperate zone, reach their best development in flavor, while at an altitude of 3,500 feet, and 400 feet farther up the mountain slopes, the apple attains a superiority unequaled by similar fruit raised at lower elevations. The variety in soil, the difference in temperature, and accessibility of transportation, are encouragements to fruit and vineyard culture that are making a valuable and profitable production, steadily growing in importance, and which will in the near future prove a source of considerable local wealth.

With so much variation in altitude, from 1,000 to 8,000 feet, there is of necessity a great difference in the climate of the different portions of Nevada County, and while one section enjoys all the advantages of California climate, others are exposed to the rigors of an Eastern winter. At Grass Valley the climate is in all respects healthful and salubrious. Its elevation above the lowlands of the Sacramento Valley lifts it above malarial influences, and its middle and mountain sections are inviting to those seeking health and recreation. The temperature is comparatively mild at all seasons. In the summer, when the days are hot in the foothills, in the mountains the atmosphere is tempered to agreeable moderation, while the nights, at even the lowest altitudes, are always comfortably cool.

There are but a few days in the year when the thermometer marks above 85°, and in winter it is seldom that the temperature goes below the freezing point in the middle section of the county; but in the Truckee Basin, which is east of the Sierra, it falls below zero, and makes it practicable to harvest ice in large quantities, which, as an article of traffic, finds an extensive market in all parts of the State.

The summer season is dry. Occasionally showers fall in the early part of June, but during the remainder of that month, and through the months of July, August, and September, rain seldom falls, and usually

in October the showers are light. The remaining months of the year comprise what is known as the rainy or winter season. In the lower foothills snow is rarely seen, and in the middle section attains but a moderate depth. It does not remain long on the ground, owing to its moist and unfrozen condition. In the higher mountains snow falls to considerable depth, covering the summit ranges, and remains late into the following summer months; and on the northern side of the higher peaks snow may be seen at all seasons of the year. It is the variety of climate, difference of elevation in the country, and the picturesqueness of the landscapes presented that makes Nevada County particularly inviting as a home, or attractive to the tourist, who always retains a pleasing recollection of a visit to this interesting and beautiful region.

The rainfall for the season is not often excessive, the average annual precipitation being about 50 inches; but there are exceptional years in which there is a variation of 8 or 10 inches above or below these figures. These figures vary, too, with the altitude, the precipitation of the higher lands and mountains being much heavier than in the valley region. The annual rainfall makes the failure of crops an impossibility, and generous harvests are almost invariable.

The abundance of rain and the melting of snow in the mountains afford an adequate supply of water for the canals and artificial reservoirs, that can be used either for the purpose of mining or irrigation, and for the latter the demand is steadily increasing for clover and grass lands and orchards.

The soil of Nevada County, in its analysis, is similar to that of Placer County, and with proper cultivation is capable of producing cereals and fruits without the aid of irrigation. Wherever irrigation has been used, crops of every character have been raised in remarkable abundance. Around Nevada City and other places where granite comes to the surface, it is decomposed and more or less intermingled with alluvial soil, and is well adapted to horticultural pursuits. Another variety of soil is found in the loam of the hillsides, which are frequently tinged a dull red, and which in its natural state supports a thrifty growth of chaparral and forest trees. This soil is free from stones and easy of tillage. A third variety is a mixture of rounded boulders and loose rock, uninviting in appearance, but still desirable land. A fourth variety is that in which the slate rock crops out along the surface, offering apparently no inducement to the horticulturist, yet excellent results are obtained from this, as is evidenced by the flourishing vineyards in the Colfax district.

There is an abundance of water stored in artificial reservoirs along the summit of the mountains, such as no other county equals. Originally these artificial lakes and expensive ditches were constructed to supply hydraulic mines. The length and capacity of the main ditches connected with the reservoirs, and size of lakes of the several companies, are as follows:

Name of Company.	Main Ditches, Miles.	Capacity, Inches.	Cost.
North Bloomfield	157	3,200	\$708,841
Milton	80	3,000	391,579
Eureka Lake	163	5,800	723,342
South Yuba	223	7,000	2,000,000
Excelsior	160	5,000	1,000,000
Totals	783	24,000	\$4,823,762

Principal Lakes.	Area, in Acres.	Capacity, Cubic Feet.	Size of Dam, in Feet.
Bowman	950	1,000,000,000	100x420
French	337	660,000,000	54x200
Weaver	100	1,130,000,000	68x100
Fordyce	790	1,800,000,000	90x700
Sterling	120	300,000,000	40x80
Totals	2,297	4,890,000,000	

Nevada County holds a prominent position among the fruit-growing counties of California, and with her great variety in soil, climate, and altitudes seems well adapted to nearly all varieties of fruit. Orchards of fruit, nut-bearing trees, and vineyards of the choicest table, raisin, and wine grapes are specialties. It having already been shown that while California, as a whole, beats the world in this direction, these foothills equal any other part of California in the quality, and in some things, as pears and winter apples, for special adaptation and regular productiveness. Within the past few years hundreds of acres have been planted in fruit trees and vineyards, and they all thrive well. Wine made from grapes grown on Nevada's foothills has an enviable reputation. Table grapes are par excellent, and the raisin does remarkably well.

The abundant rainfall is especially propitious for the growth of the Bartlett pear, which here reaches its perfection of growth. This fruit finds a ready market in Eastern States and brings good prices. It is a common occurrence to have trees yield 700 and 800 pounds, and they uniformly sell for 1½ cents per pound, which admits of big profit.

Oranges grow well here. In at least half of the circuit, in all that part below the bench upon which Grass Valley is situated, in the lands 1,000 to 1,600 feet above sea-level, the thermal belt of the foothills, the citrus fruits are at home.

Of course, any kind of fruits adapted to temperate zones flourish in Nevada County. The olive, fig, prune, and all kinds of berries are numerous.

Around Nevada City the soil, which yields so abundantly to the miner, gives rich recompense to the horticulturist. Not only are the house yards of town residents mainly devoted to the growing of apples, pears, peaches, cherries, prunes, berries, grapes, and nuts, but the contiguous country is fast being converted into a veritable garden by sturdy and far-sighted toilers, whose orchards and vineyards dot the hillsides in every direction.

With an average annual rainfall of 52 inches, an altitude above sea-level of 2,600 feet, a temperature that seldom if ever drops below zero in midwinter, or rises more than 96° above that point in summer, and with

a deep and rich soil, it is no marvel that fruit growing succeeds here, and that the income from this source is growing larger with each passing year.

The principal fruit sections of Nevada are Chicago Park, Grass Valley, Nevada City, San Juan, French Corral, Rough and Ready, and Anthony House. The chief fruits grown in these sections are apples, pears, peaches, plums, cherries, grapes, and nuts.

From points contiguous to railroads much of the fruit produced in this county is shipped direct to Eastern markets. Next comes home and local consumption; then the mining, grazing, and lumber country to the east and north, where no fruit is raised. Some winter apples are shipped to the lower valleys.

The fruit for Eastern shipment is packed in regular standard boxes and crates, and for the mountains and mining trade in all sorts of packages, as the fancy of the seller may dictate.

The output of fruit in Nevada County for 1891, together with an estimate for the present year, are given below:

	1891— Pounds.	1892— Pounds.
Apples	7,000,000	2,000,000
Apricots	300,000	2,000
Cherries	500,000	10,000
Peaches	325,000	25,000
Pears	2,200,000	600,000
Plums	122,000	4,000
Almonds	140,000	74,000
Walnuts	280,000	90,000
	10,867,000	2,805,000

As will be seen from the above, there has been a very large falling off in the output of fruit for 1892 over the season of 1891. Peaches, apricots, plums, and cherries were nearly all destroyed by a late frost, so heavy as to destroy the young leaves on the trees. Cold rains coming later in the season also hurt the apples, pears, and other varieties of fruit.

The prices paid for fruit in Nevada County this year are a very material increase over those of last season, the prices per pound of both seasons for various fruits being appended:

	1891.	1892.
Apples	1 to 2c.	2 to 2½c.
Apricots	1 to 1½c.	1½ to 3c.
Cherries	5 to 10c.	6 to 10c.
Peaches	2 to 3c.	5 to 6c.
Pears	1 to 1½c.	1½ to 2½c.
Plums	¾ to 3c.	3 to 5c.
Almonds	9 to 12c.	10 to 13c.
Walnuts	8 to 9c.	9 to 12c.

These prices are for dried fruit.

The area now planted to fruit in Nevada County is from 1,500 to 1,600 acres, of which from 175 to 225 acres were planted during the season of 1891.

Some of the oldest orchards in Nevada are those of the Barker ranch, owned by E. Sherman; Mr. William Towne's orchard; the Butler ranch, owned by George Butler; the James vineyard, and that of J. C. Cole. That owned by J. C. Cole was set to apples, peaches, and pears as early as 1855, the stock being from seedlings procured from Marysville.

ACREAGE AND VARIETY OF FRUITS IN NEVADA COUNTY.

Variety.	Acres in Trees.			Plant of 1892.
	Bearing.	Non-Bearing.	Total.	
Apple	300	60	360	20
Apricot	15	26	41	12
Cherry	10	16	26	5
Fig	4	10	14	3
Olive	2	11	13	4
Peach	226	100	326	28
Prune	45	20	65	10
Pear	249	407	656	93
Plum	4	5	9	2
Orange	$\frac{1}{2}$	$1\frac{1}{2}$	2	1
Nuts—Almond	14	10	24	3
Walnut	13	6	19	1
Raisins	14		14	
Table grapes	105		105	
Small fruits	4		4	
Totals	1,005 $\frac{1}{2}$	672 $\frac{1}{2}$	1,678	182

ORANGE COUNTY.

Orange County is, next to Glenn, the youngest county of California, having been organized by the legislative session of 1889, from a portion of Los Angeles County, which bounds it on the north; on the east is San Bernardino and on the south San Diego County, while its entire western border, a distance of 40 miles, is skirted by the Pacific Ocean. Its area is 665 square miles, or 425,978 acres. This is divided into mountains, 65 square miles; foothill, 100 square miles, and valleys, 500 square miles.

The Santa Ana range of mountains is the line between Orange and San Bernardino Counties at the northeast corner of the former county. It is also the dividing line between Orange and San Diego Counties on the east. This range also sends up a line of foothills westwardly along the seashore nearly half way across the county. All of the western portion of the county is included in the Santa Ana Plain, or Valley. There are also several small valleys among the foothills and along the mountain streams. The Santa Ana Plain is covered with rich loam, and, with the exception of some patches of alkali, is very productive. The highest point of land is what is locally known as Saddleback, or Santa Ana Peak, with an elevation of 5,675 feet.

There is an abundant water supply in this county. The Santa Ana River enters the county near the northeast corner, and traverses the entire Santa Ana Plain, flowing into Newport Bay. Besides this stream there is Santiago Creek; also Aliso, Trabuca, Mission Vieja, San Juan, and Coyote Creeks, and other streams. The last-named creek forms the boundary between Orange and Los Angeles Counties on the west. Apart from these streams there are probably one hundred natural flow-

ing wells and one thousand artificial wells. The latter can be increased indefinitely, water being obtained from 35 to 250 feet. The water is sweet and pure, and practically inexhaustible. A vast sheet of water, percolating through underlying gravel deposits, may be reached in almost any portion of this fine valley, and, in connection with the running streams referred to, affords all the water needed for irrigating and other purposes.

The climate of Orange County does not differ to any great extent from the climate of Los Angeles. On the immediate coast heavy fogs are common in the early spring months, but these are not of long duration, nor do they usually extend far into the interior. As the matter of temperature and precipitation is treated of under the Los Angeles caption, no further allusion need be made to it here.

In the foothills of Orange County a sharp, gravelly loam of a reddish color prevails. Descending into the valleys this loam loses its color and its sharpness and becomes black, with a large admixture of adobe and frequent streaks of alkali.

Beginning about one mile west of Santa Ana is a deposit of alkali. Here is a strip about 10 miles long, which will average something like a mile in width, and on the west side of the Santa Ana River patches of this mineral may be found impregnating the soil in the vicinity of Westminster and Garden Grove. West of the Santa Ana River large deposits of peat are found, the product of tule roots and other swamp vegetation. This varies in depth from a few inches to 16 feet. This land is considered the best for agricultural purposes in the county, and is held at a high figure by its owners.

Three systems of irrigation have been adopted in this county. One, the Santa Ana Valley Irrigating Company, is working under an ordinary corporation. It is confined to the Santa Ana Rancho, and obtains water from the Santa Ana River. Each acre is counted a share, and at present extends to 20,000 acres. Another is organized under the Wright Act, and is called the Anaheim Irrigation District, and includes 32,000 acres about that town. The company has issued bonds to the amount of \$60,000 to buy out a private company, and to extend its system of ditches. It also obtains water from the Santa Ana River. The John Carpenter Water Company embraces a territory of about 3,000 acres. Its source of water supply is Santiago Creek. Besides that above mentioned, there are some 25,000 acres that can be irrigated from artesian wells.

All the fruits do well in Orange County. Many varieties of oranges and several of lemons are grown in this county, taking their names generally from the party introducing them, the country from which brought, or a peculiar marking of the fruit. The Mediterranean Sweet, Washington Navel, Valencia, Kohna, and Mission, or Seedling, are the varieties generally preferred. Of lemons, the Genoa, Eureka, and Lisbon may be named.

Oranges are shipped from here from the last of December until June, the bulk in March and April.

There is an impression abroad that while Southern California is especially adapted to oranges and other semi-tropical fruits, it is not well suited to the culture of deciduous fruits, especially apples. There are some portions of Orange County where apples are grown which vie with those of the Eastern States or Oregon in size, flavor, and appear-

ance. The error is partially excusable, because it is only during the past few years that much fruit besides oranges and grapes has been grown here. Now, however, large orchards are annually being planted to almost every variety of fruit that is known.

The principal fruit sections of Orange County are Westminster, Garden Grove, Anaheim, Orange, Santa Ana, Fullerton, Placentia, and Tustin, and apricots, peaches, apples, oranges, lemons, figs, prunes, and walnuts do well in this county, apricots especially holding front rank with walnuts in the second place.

The larger amount of the fruit produced in Orange County finds a market in the East, the citrus fruits and walnuts being shipped entirely out of the county. The deciduous fruits are very largely disposed of to the fruit-drying establishments and packing houses, and by them shipped both dry and green to the Eastern States. Fullerton alone shipped in the season of 1891, 50 carloads of oranges, 1 carload of lemons, and 4 carloads of walnuts.

Capistrano reports 6 carloads of oranges shipped in 1891, 9 carloads of walnuts, and about 65 tons of other fruits.

There has been a very considerable acreage of new fruit planted in Orange County during the present year, a very large percentage of which consists of citrus fruits. Small fruits are not grown to any extent, but where cultivated give a very large yield.

The crop outlook for the present year is generally good, excepting for prunes and other stone fruit. The walnut yield will be fully up to the average, and the citrus fruits are promising to return more than the average yield.

ACREAGE AND VARIETY OF FRUITS IN ORANGE COUNTY.

Variety.	Acres in Trees.			
	Bearing.	Non-Bearing.	Total.	Plant of 1892.
Apple.....	86	42	128	42
Apricot.....	1,112	380	1,492	350
Fig.....	33	49	82	49
Olive.....	39	31	70	31
Peach.....	1,016	187	1,203	100
Nectarine.....	30	.....	30	.....
Prune.....	1,657	131	1,788	101
Pear.....	670	133	803	103
Plum.....	5	.....	5	.....
Lemon.....	251	230	481	122
Orange.....	5,286	126	5,412	126
Nuts—Almond.....	2	.....	2	.....
Walnut.....	1,467	1,125	2,592	1,000
Raisins.....	422	504	926	504
Table grapes.....	130	30	160	30
Totals.....	12,206	2,968	15,174	2,558

PLACER COUNTY.

Placer County lies between latitude 38° 70' and 39° 30'. Its direction is northeast and southwest, and it is about 100 miles long and of varying widths, from 10 to 30 miles, the course and distance being defined by the course of the rivers which define its boundaries. It extends from about 8 miles from the Sacramento River to the summit of the Sierra Nevada

Mountains. Just above Auburn, between the Bear and American Rivers, the county is very narrow, being but about 8 miles across. Above Auburn it widens out into the two divides lying between the Bear River and the Middle Fork of the American River. These are known as the Dutch Flat, or Railroad Divide, and the Forest Hill Divide. The southwestern portion of the county is more regular in shape than the part just described, being bounded on the east by El Dorado County, on the south by Sacramento, on the west by Sutter County, and on the north by Nevada County. This section contains the foothill and agricultural lands. Its shape is nearly a parallelogram, the southwest two thirds being on the plain proper and the northeast one third being the foothill and fruit district.

The area of Placer County is 1,429 square miles, or 950,000 acres. Of this 810 square miles are mountains, 450 square miles foothills, and the remainder valleys. The entire extent of the county faces toward the west, extending from an altitude on the plains in the western portion of the county of some 40 feet to over 7,000 feet at its eastern boundary line, embracing nearly every variety of climate known in the State. At the eastern boundary of the county, separating it from the State of Nevada, is Lake Tahoe, one of the most picturesque lakes in America. The topography of Placer County is as irregular as is its shape. Imagine the whole Atlantic Coast from Labrador to Tallahassee incorporated into one county, and one will have a fair idea of what may be found in Placer, exaggerated as to size, but not as to the great variety of climate, elevations, soils, and resources.

In fact, as to resources, the whole Atlantic seaboard can hardly equal the endless variety to be found within the borders of this single county, which rivals Florida in the quality of its oranges, excels New Jersey in peaches, equals the New England States in its granite quarries, and compares favorably with Maine in the quality of its lumber.

From an elevation of about 2,500 feet up to the summit of the mountains snow falls in the winter season, light at the lower edge of the line, and increasing in depth as it ascends the Sierra. Here is a strip of territory from the snow line up to an elevation of 3,000 feet, where the snowfall is not greater than in New England, and where the winter temperature is much higher. It is particularly well adapted to the apple, the pear, and a great variety of vegetables.

At Auburn, the county seat, the average temperature for winter is 46.2°; for spring it is 56.4°; summer, 74.3°; autumn, 61.7°. The yearly mean of the maximum temperature at Auburn is 83.17°; at Colfax, 85.42°; at Rocklin, 84.33°.

The average annual rainfall at Colfax is about 46 inches, and at Auburn it is about 26 inches.

The soil of the western or valley portion of Placer County around Roseville, Lincoln, and Sheridan, is of the same general alluvial composition as all the soil in the great Sacramento Valley, and is well adapted to the growth of grain. Over 30,000 acres are annually devoted to wheat, barley, oats, and hay. The low foothills back of Lincoln are excellent for the grape, and many new vineyards are springing up in that locality. They produce table grapes, wine, and raisins of superior quality.

The soil of the valley lands is mostly a red loam, mixed with considerable clay in spots; that of the foothills is a gravelly red loam, in

places light and sandy, and is excellent for the production of fruits. Farther up the soil changes to a red character with a slate bedrock. This, too, is very fertile. The agricultural region includes the valley and foothill lands all the way from the western boundary of the county to an elevation above Colfax. The foothills everywhere possess a soil which only needs cultivation. The granite soils around Newcastle are composed largely of clay, sand, soda, potash, lime, phosphorus, iron, and magnesia. The constant decomposition that is going on appears to be of nearly endless duration, and of such a nature as to render the soil almost inexhaustible. Artificial fertilization is entirely unnecessary.

For an irrigation water supply Placer has three sources—the Yuba, Bear, and American Rivers. Including its branches, the Bear River irrigation ditch is 200 miles in length. This system is now the property of the South Yuba Water Company, who have increased its capacity and bring water from the Yuba River, so that abundance of water is assured. There are several other canals originally built for mining but now used for irrigation.

Placer County holds a foremost position among the fruit counties of the State, being the most easterly of the counties of California. With the Central Pacific Railroad running the entire length of her territory, she is one day nearer the Eastern market than any other part of the State, a very large item in the shipping of green fruit to market. In her thermal belt fruit ripens earlier than in most other places in the State, another large advantage to her. There is hardly any fruit in the entire range of production that will not grow in some portions of Placer. Pears, plums, prunes, apples, apricots, cherries, persimmons, pomegranates, quinces, and figs all do well. Peaches have been grown to some extent for the past twenty-five years, and in all that period a failure of a crop has been unknown. Some fine oranges have been produced, and Placer holds a position beside Butte in the northern citrus belt. In the production of small fruits, berries, and table grapes, Placer holds a foremost place.

The granitic belt from Rocklin to Newcastle is one of the foremost fruit districts of California. Its rolling lands are covered with orchards and vineyards. The chief fruits are the cherry, fig, nectarine, peach, olive, and orange, in all of which it excels. No other section produces earlier fruits, and it is estimated that for the last three or four years Placer County has shipped about one seventh of all the green deciduous fruit sent East from California.

There are large shipping houses at Loomis, Penryn, Newcastle, Auburn, and Colfax. Newcastle does the heaviest forwarding business, and the total shipments from the county have increased from 6,000,000 pounds in 1886 to 7,459,688 pounds in 1887, 12,000,000 pounds in 1888, and about the same proportionate increase for 1889 and 1890.

The decomposed granite soil of the fruit belt just mentioned requires plenty of irrigation for the best development of fruit and vegetables, and water is supplied in abundance by the Bear River Ditch, owned by the South Yuba Water Company. The main line of this ditch is 60 miles long, and its branches give the farmers of Placer a total of over 100 miles of ditches for irrigating purposes. This service will be increased next year by the continuation of an old mining ditch, which now ends at Gold Run, to a point below Colfax, where the present Bear River Ditch comes out on the divide above Auburn. This new ditch

will have a capacity of 5,000 inches, and the same company will also build a new storage reservoir above Bear Valley, in Nevada County, to supply the increasing demand in Placer.

Placer County is a very large producer of peaches, Bartlett pears, plums, and table grapes. These are the chief fruits produced here, although nearly the whole range of temperate and semi-tropical fruits is grown. Almost the entire fruit crop of this county is sent green to the East. The Central Pacific passes along the entire length of Placer, which is the nearest fruit section in California to Nevada and the East. As a result, fruit from this county reaches market much earlier and in better condition than it does from more remote counties. There are no packing houses or driers here, and the entire crop may be said to reach market green. For shipment, pears are packed in 40-pound boxes, peaches in 20-pound boxes, plums and table grapes in 20-pound crates, and cherries in 10-pound boxes.

Pears and peaches are wrapped separately in paper, plums are packed with paper between the layers, and cherries and grapes loose in the boxes.

The total output of fruit from Placer County for 1891, in comparison with that of 1892, is presented below:

	1891— Pounds.	1892— Pounds.
Cherries	700,000	600,000
Peaches	11,000,000	13,000,000
Pears	3,500,000	3,700,000
Grapes	500,000	2,000,000
Apricots and nectarines	500,000	400,000
Apples and miscellaneous	1,510,669	1,600,000
Plums	1,000,000	1,200,000
Totals	18,710,669	22,500,000

The reduction in the output of the present season's crop is due to the general shortage in the State, caused by late rains and a light frost, which caught the orchards in full bloom.

The chief fruit sections of Placer and the fruits to which they are especially suited are as given below: Loomis, peaches, figs, and grapes; Penryn, peaches, pears, plums, and grapes; Newcastle, peaches, pears, plums, cherries, and grapes; Auburn, pears, grapes, and peaches; Colfax, pears and grapes.

ACREAGE AND VARIETY OF FRUITS IN PLACER COUNTY.

Variety.	Acres in Trees.			
	Bearing.	Non-Bearing.	Total.	Plant of 1892.
Apple	202	130	332	27
Apricot	94	186	280	43
Cherry	197	75	272	31
Fig	55	37	92	12
Olive	64	355	419	57
Peach	1,951	1,670	3,621	430
Nectarine	10	3	13	1
Prune	127	102	229	30
Pear	499	570	1,069	122
Plum	211	165	376	29
Lemon		5	5	3
Orange	53	220	273	54
Nuts—Almond	26	43	69	17
Walnut	7	15	22	
Raisins	128		128	
Table grapes	1,174		1,174	
Small fruits	28		28	
Totals	4,826	3,576	8,402	856

PLUMAS COUNTY.

Plumas is a mountain county, and much of what has been said in describing El Dorado, Alpine, and Placer Counties is applicable to Plumas. Mountain chains define its limits on several sides, its bounding counties being, on the north Shasta and Lassen, on the east Lassen, on the south Sierra and Butte, and on the west Butte and Tehama.

This county extends for a distance of 50 miles from north to south, and 75 miles from east to west, in the heart of the Sierra, having Lassen Peak, with an elevation of 10,577 feet (Whitney), on its northern border, and Pilot Peak, 7,605 feet, and Spanish Peak within its boundaries. Between the parallel ridges and spurs of the mountain range there are some picturesque and fertile valleys. The Feather River and its tributaries, with their deep cañons that have cut down in places to a depth of over 2,000 feet, afford drainage to the county into the Sacramento River. It has less plain land than the counties lying to the south; but, on the other hand, Plumas County differs from the counties lying to the south of it in contour, the surface being more of a rolling character. A great deal of rich valley land is thus placed at the disposal of the husbandman. There is virtually no limit to the fertility of the soil in those valleys, composed as it is of the alluvial deposits carried down by the melting snows and the rains of centuries from the overhanging Sierra. Still, much of Plumas is up among the mountains, lying in the midst of the Sierra Nevada range. Some of its scenery is among the wildest and most picturesque in the State, snow covering the summits of the mountains, their slopes being clothed with magnificent forests of pine, fir, and oak trees, and high ridges alternating with abrupt chasms and deep cañons, through which tumble running streams. There are grassy valleys of considerable extent throughout the county, which are cultivated by agriculturists, among them being Big Meadows, Mountain Meadows, Indian, Genesee, American, Beckwith, Butte, and Meadow Valleys. Big Meadow Valley, 15 miles long by 4 miles wide, is

the largest of these mountain valleys, and is immediately adjacent to Mountain Meadows, of nearly the same size, and also to several smaller valleys, also cultivated, the whole constituting a plateau high up in the mountains, the elevation being 4,500 feet. Indian Valley, an important and prosperous district, is 11 miles in length by 2 miles in width, and American Valley being the same size. Both connect with smaller valleys, and support several small towns, as well as the farms scattered over their extent. All these valleys are fertile, well watered and timbered, and contain an area of agricultural and grazing lands sufficient for the support of many thousands of people.

The greater part of Plumas County is located in the Sierra Nevada Mountains, and has the climate peculiar to that section. In the higher altitudes are long, cold winters, with heavy snowfalls and zero weather. In the valleys the winters are much less severe, being only moderately cold. The summers are perfect. Intense hot weather is unknown even in the lower valleys. The rainfall will average about 40 inches annually.

Where irrigation is needed Plumas has abundant water for the work. Mountain rills run down every cañon and ravine, and streams take their course through every valley. Two important branches of the Feather River rise in this county. The valleys are well watered, but generally treeless. Pure mountain springs and streams abound, and are found very desirable for dairying and general farming. Many of the valley ranches are irrigated from mountain streams. Round Valley reservoir covers about 1,000 acres, and supplies water for mines and for irrigating the lands of Indian Valley.

Many parts of Plumas County are especially adapted to deciduous fruits, and apples and pears do especially well there. Plums, prunes, nectarines, and peaches also do well in many localities, and where favorable conditions exist the trees are very prolific. A writer in the "Resources of California" says of the fruit of Plumas County:

"The berry and small fruit family is exceedingly prolific. Currants, gooseberries, blackberries, raspberries, and strawberries grow in great profusion and perfection; so much so, that tons of them annually go to waste for the want of an exterior market. A few square rods on the Huntington ranch, near Taylorsville, produced in one year the enormous quantity of 300 bushels of luscious strawberries, such as only the sheltered vales in the mountains can produce. These were sold at 16½ cents a quart; and had they all found sale, they would have returned the producer \$1,600, the net income from which would be at least \$1,200. On the Williams ranch, near Greenville, a similar result has been accomplished in berry culture. In the former case the ground was literally red with the juicy titbits, and perhaps more than half of them went to waste. But this exuberance of berry fruitage only illustrates what hundreds of similar places tributary to the mountain valleys can do, both in small fruits and the standard large fruits. In dells and vales lying at the base of mountain slopes facing to the south, from which slopes these sheltered places receive, by radiation at night, the heat absorbed during the day, all the common large fruits are produced in great abundance and of the most excellent flavor. Such places are the Boyle ranch in American Valley, the Martin ranch at Shoo Fly, and the Flournoy ranch in Genesee Valley, which produce, respectively, hundreds and thousands of boxes of the very choicest apples, pears, peaches, plums, prunes, nectarines, quinces, etc., yearly, at 2 to 3 cents a pound. The Flournoy place, from 220 trees, yields this year 2,500

boxes of apples, worth \$1 a box in the orchard. These instances again only illustrate what can be done in many similarly covered mountain niches and gorges in the matter of fruit culture, although Plumas County is not considered a fruit county. We have mentioned this small industry of 2,000 trees, reported within the small territory traversed, to show the folly of the mossback and constitutional pessimists who are ready to depreciate the resources of the county. But the want of an exterior market keeps the possibilities of many of her industries in abeyance."

In Plumas County there are very few orchards of any extent, and no planting has been done for many years. This is essentially a mining county, and, with the decadence of the mining industry, what little was done in the way of orchard work has been practically discontinued. A few small family orchards are found in the county, but very little fruit is grown for market, and none at all for export. That grown, over the quantity used in family consumption, is sold in the local market and to miners.

The fruits that thrive there are apples chiefly, also pears, cherries, and, in some favored localities, peaches and plums. The localities where fruit is grown are the American Valley, Indian Valley, and Feather River at Rich Bar. At the last named point the finest fruit grown in the county is produced. Fruit has been grown in Plumas from a very early period, a number of small orchards having been planted during the early mining days of 1856 to 1860.

Plumas has no railroad communication with the outer world, and while the smaller fruits and berries and the hardier varieties of tree fruit would do well in most parts of the county, the lack of means of transportation renders fruit growing impracticable.

One of the principal orchards of the county is that of Robert Martin, at Shoo Fly. He has some 5 to 8 acres in apples, pears, peaches, plums, and cherries, the product of which he disposes of to the towns and mines in the vicinity.

The output of fruit in Plumas will be very light for the present season, apples and pears not averaging over half the usual crop, and other fruits falling below the usual average.

Irrigation is resorted to on a very small scale; a few farmers living on the mountain streams divert a little water to their land, but there is no systematic irrigating done.

The principal ditches of this county are used for mining purposes, and aggregate some 40 miles in length, with a valuation of \$7,000. The irrigation ditches will aggregate 18 miles, with an assessed value of \$1,450.

ACREAGE AND VARIETY OF FRUITS IN PLUMAS COUNTY.

Variety.	Acres in Trees.		
	Bearing.	Non-Bearing.	Total.
Apple	50	10	60
Cherry	2		2
Peach	3		3
Pear	16		16
Plum	4		4
Totals	75	10	85

SACRAMENTO COUNTY.

Sacramento County, one of the foremost counties of the State, and from a horticultural point of view *the* foremost county, is virtually the geographical and railroad center of the State, for while it is north of the middle line of the State, it lies directly in the center of the principal fruit and productive counties of California. It is bounded on the north by Placer and Sutter, on the east by El Dorado and Amador, on the south by San Joaquin, and on the west by Yolo and Solano Counties. Its area is 968 square miles, or 640,000 acres, all of which is practically arable.

The western boundary of the county for over 50 miles is the Sacramento River, the great navigable waterway of the State, and the southern boundary is the Mokelumne River. The American River traverses the county from east to west near the northern line, and the Cosumnes River crosses it from northeast to southwest. There is no mountain land in the county, most of it being almost flat or gently rolling valley land, with an altitude of from 30 to 75 feet above sea-level. In the extreme eastern portion of the county the rolling foothills of the Sierra Nevada commence, but the highest altitude in the county will not exceed several hundred feet.

The climate of Sacramento County is that of the better portions of California, which has made the State famous, and of which the ordinary Californian thinks little and speaks less. The figures here given of temperature, etc., are from the official records of the Signal Service, furnished by James A. Barwick, of Sacramento, Observer of the Weather Bureau and Director of the State Weather Service. The average rainfall is 20 inches, and there has never been a failure of crops in the county. Snow does not fall in Sacramento County, *i. e.*, she has had once in the past six years a fall of snow sufficient to measure, and which melted almost as soon as it fell. The thermometer rarely falls below freezing point—32° above zero. The past winter it has been below that point only six times, all in the month of December, the lowest being 27° above zero. Following is the record for December, 1891, and the first three months of 1892:

	Dec.	Jan.	Feb.	Mar.
Lowest reached	27.0	33.0	32.0	39.0
Highest reached	65.0	64.0	70.0	78.0
Mean for month	44.2	48.4	52.2	55.9

The mean temperature at Sacramento for years past is 60.5°. The mean temperature for March, 1892, as given by Signal Service Observer Barwick, was 55.9°. The highest and lowest temperature for the same month was 78° on the 7th, 9th, and 10th, and 37° on the 28th. The rainfall, 3.02 inches; clear days, 17; fair days, 8, and cloudy days, 6. The average temperature for March for forty years has been 54.9°. The summer months are warm, the highest reached last year being 104°. It is dry heat, however, bodily evaporation and radiation being free, and work is never stopped in the harvest fields or orchards. In ten years past there have been but nine nights when the thermometer went above 70°. She has an average in the year of 244 cloudless and 76 fair days. The first fruit blossoms have shown in Sacramento

County during the past twenty years as early as January 20th, and as late as February 29th. Last killing frosts in the same period have ranged from January 9th to April 6th.

The soil of Sacramento County may be divided into three general classes:

First—The river bottoms, a rich alluvial deposit, and of this soil there is a very large acreage along the various rivers of the county.

Second—A higher bottom, left by ancient waterways, the soil being a deep, sandy loam.

Third—The red soil of the plains and lower foothills.

All of these soils are particularly adapted to the best paying crops in fruit and produce. The lands close to transportation are all under cultivation, but by going into the southern and eastern portions of the county several hundred thousand acres can be found which are practically unoccupied, and may be bought at from \$25 to \$100 per acre.

Along the lower Sacramento River there are several large islands, bordered by sloughs and arms of the river, which contain some of the richest and most valuable soil in the world. Most of these islands have been effectually leveed and reclaimed, and in the coming years will become the garden spot of the coast. Grand Island, which is now thoroughly reclaimed, contains some 18,000 acres, every foot of which is capable of producing several crops per year of various kinds of vegetables. Some of the finest pear orchards in the State are on these river islands. The best lands are those which lie along the river banks. These are chiefly devoted to the growth of fruit and vegetables, and yield almost fabulous crops.

No other county in the State has such facilities for irrigating as Sacramento, though they have not been fully developed. She has an unlimited water supply in her various waterways, and land of gentle grade that is easily irrigated. Her bottom lands need no irrigation, save for garden truck, and for such use water is pumped out of the river if convenient. All over her plain land, surface water is found at from 4 to 30 feet, and raised by centrifugal pumps for irrigating purposes. The Folsom Water Power Company has already all surveys made for a system of canals and ditches covering about 300,000 acres of the best lands, the water to be taken out on both sides of the American River at the company's dam, above Folsom. The most perfect system of irrigation in the county, and one of the best in the State, is that of the Orange Vale Colony, which irrigates 3,200 acres of rolling orchard and vineyard land by means of water carried under pressure in underground steel pipes of from 26 inches to 4 inches in diameter. The water is distributed in furrows from the highest point of each 10-acre tract, the furrows being cultivated in the next day, so that there is no loss by evaporation and no menace to health from open ditches.

The following article on fruit production in Sacramento County is from the pen of P. E. Platt, President of the Sacramento City Board of Trade. He is a gentleman thoroughly conversant with the subject on which he writes:

"Sacramento County may properly be called the grand center or headquarters of the California green fruit business, so far as the Eastern shipments of this leading production of the State are concerned. The business commenced about twenty years ago at Sacramento in a small way, and has steadily increased until the fruit shipments from

this point now constitute about the heaviest item of exportation from the State. As will be seen by a glance at the map, Sacramento is geographically located in almost the exact center of the State. Its position on the principal line of railroad makes it the natural point from which Eastern shipments originate. It is also a railroad center, and every leading fruit-growing district is directly tributary. All the leading fruit-shipping institutions in the country have their headquarters at Sacramento. It is not particularly the purpose of this article to point out the commercial advantages of this city, but incidentally these are worthy of note, and especially so in consideration of the fact that Sacramento combines with these commercial facilities the further advantage of being the center of a remarkably productive fruit section. It is of this latter feature that I propose to speak at this time.

"Sacramento County contains 620,000 acres of land, nearly every acre of which can be profitably cultivated. There are four distinct varieties of soil: First in value being the rich sediment soil of the river bottoms; next, a deep, sandy loam constituting what may be called a second bottom; third, a shallower soil of the plains; and fourth, the foothill land, which is of a gravelly nature, in many cases being formed of decomposed granite. These various descriptions are of course of different values, but each is peculiarly adapted to the production of some variety of fruit or vegetables. Land values in Sacramento County naturally vary from say \$30 to \$500 per acre for unimproved property. To some the latter price may seem high, and yet land at \$500 per acre is frequently found to be a most profitable investment. It is truly surprising the amount of product that can be taken from a single acre of our best land. The writer has in mind an acre of cherry trees grown on the variety of land above described as second bottom, which last year produced a net income of nearly \$1,500, while Bartlett pears have frequently produced from \$600 to \$800 per acre net to the producer in a single year.

"A list of the products or principal productions of Sacramento County would be a very long one. I think it is safe to say that there is no spot on earth where a greater variety of products can be grown, or where crops are surer than in Sacramento County. In this article I will only speak of a few of the leading kinds. It is possible for the fruit grower here to gather some kind of fruit every day in the year. During the winter months pomegranates, persimmons, oranges, lemons, and olives mature. The foothill district is especially adapted to the growth of oranges and olives. The most notable demonstration of this fact may be found in a colony near Folsom. Several thousand acres are being planted in this colony, which has been in course of development for three or four years past. In this connection it may be considered well worthy of note that oranges ripen in this part of the State much earlier than they do south, which I think may be accounted for by reason of its sheltered inland position, keeping it free from the influence of cold ocean trade winds during the ripening months of October and November. This fact of early ripening of oranges makes the industry vastly more profitable, as the fruit is ready for market before the holiday season, and long before the heavy Florida crop comes into competition. It has been a common thing for oranges grown in this section to sell at from \$3 to \$5 per box, and they have never sold below \$3. I am told that orange growing is profitable at 50 cents per box.

These figures carry their own inference. It may be mentioned that the quality of citrus fruits produced here is not excelled in any section of the country; bright, solid, heavy, juicy fruit, of good flavor, is what the market demands, and all these essentials are found in Sacramento-grown oranges.

"Not all land in California, by any means, is adapted to growing oranges. On the contrary, it is only in favored spots, in any part of the State, that the best results can be had. The foothill districts of Sacramento, Placer, and Butte Counties show many such locations, and during the past four or five years a very large acreage has been planted to lemons and oranges.

"I next come to the consideration of what may be called spring fruits. These embrace strawberries, raspberries, blackberries, and cherries. Every acre of arable land in Sacramento County will grow the finest strawberries. It is a profitable crop when properly and intelligently handled. The only drawback seems to be that occasionally late rains during the months of April and May occur, and seem to injure the fruit when it is ripening. These occurrences are the exception, and not the rule. I think it is true that strawberries grown in Sacramento County are of better keeping quality than those grown anywhere else on the Pacific Coast. They are, when properly handled, easily transported to points as far east as the Missouri River, and there is an unlimited demand for them up to the time when the same fruit matures in the East. This generally gives the entire months of April and May for a clear market to the Sacramento producer.

"Raspberries and blackberries are not grown so extensively as they might be. The former is a very profitable crop; the latter not so much so. Cherries should be planted much more extensively than they are; still it is true that there are a good many large orchards in this county, and I think it is also true that they are universally very profitable. The writer is interested in an orchard of cherries located just east of the city of Sacramento, from which twenty boxes per tree have been picked, and sold at an average of over \$1 per box, the trees being only six years old. Cherry culture should be one of the most lucrative callings any one could follow. The fruit ripens here during the latter part of April and early May, and is of such quality that with the recently improved transportation facilities, it can be delivered in New York or any other Eastern city in prime condition, and long before similar fruit can be had from any other section in the country. Following the early spring fruits, other varieties come in rapid succession, such as apples, apricots, peaches, plums, nectarines, pears, and grapes. These of course are divided into a large number of varieties, but I think the Sacramento fruit grower has demonstrated the fact by much experimenting in the past, that more money can be made from a limited number of varieties than by producing a great many kinds. In apples, the Red Astrachan, Early Alexander, and White Astrachan have been found to be most profitable. I think all these mature in Sacramento County earlier than they do in any other part of the State, and consequently earlier than they do in any other fruit-producing section of the United States; the result is that they can be marketed to advantage in all parts of the country, especially at points this side of the Mississippi River. It would not, however, seem to be advisable to plant late varieties of apples here, as they do much better in the foothill and mountain districts. The

apricot is not a favorite fruit for the table in the East, except in a preserved form. Still, a limited quantity of them find their way East to advantage; but dried and canned they have always been profitable. The usual varieties are grown and are remarkably prolific, especially on the Sacramento and American Rivers. I venture the opinion that this fruit will grow in favor.

"A trip through the peach orchards of this county during the months of May, June, and July would open the eyes of any one not familiar with what can be done in this favored section. The foothill peaches are the finest in appearance and flavor; but I think the peach grower finds more profit in the deep sediment lands of the river bottoms, by reason of the greater productiveness. I have never known a failure of the peach crop in this county, and have never seen the time when growers could not dispose of their crop to good advantage.

"Plums and prunes are next in importance. Both of these grow to great perfection. I think the largest and finest prunes I ever saw were grown on the American River. Many years ago, Hon. Joseph Routier, one of California's best horticulturists, drew attention to what could be done in the culture of the prune. Many others have followed his example, and yet there is room for great development in this line, especially along the line of the American River, where a large tract of land is adapted to it.

"The best authorities are now agreed that the California Petite prune must soon drive out the imported article, and then our State will enjoy the entire trade of the United States. It has certainly been sufficiently profitable up to this time, and no fear of overproduction need be entertained. American River prunes have always sold at from 6 to 10 cents per pound. I am told that the product would be profitable at 3½ cents.

"A great many varieties of plums are grown, among them being the celebrated Tragedy prune, the earliest grown in America of a large size. These originated in Sacramento County. They are shipped East every year, and realize fabulous prices. A good many have been planted out during the past year or two, and naturally when production is largely increased prices will diminish, but I think they will always be profitable. Shipments of plums continue during the months of June and July on a very heavy scale.

"If Sacramento is celebrated in horticultural circles for one fruit more than any other, it is best known on account of its Bartlett pears. They mature very early, the first shipments being made about the 20th of June. The quality of the Sacramento Bartlett is known all over the United States. The county has not, in my opinion, been properly accredited with this production. I think that every box of Bartlett pears leaving Sacramento County should, in justice, be labeled with the name of the county, on the principle that credit should be given where credit is due. This would be only just and proper. These pears have been shipped in great quantities from Sacramento City to every market of any size in the United States, and are as well known in New York, Boston, Chicago, New Orleans, Minneapolis, and St. Louis, as in San Francisco. It embraces all the fine qualities that can be found in any pear grown in the world. It grows on the rich lands of the Sacramento and American Rivers in larger quantities and better sizes than anywhere else in the world, I think. It has always been one of the most profitable productions of our section. The crop never fails. It is

easily cared for, gives employment to a great many people, and whether dried, canned, or consumed in a green state, is a most delicious luxury. They can be profitably grown at 50 cents per box, but have always been sold at nearly double that price.

"Sacramento County, I think, produces the finest grapes that are found in California. It is true that the highest prices ever paid for California grapes in the New York market have been paid to Hon. R. D. Stephens, whose vineyard is located on the American River, 10 or 12 miles east of the city of Sacramento. The prices realized by Mr. Stephens have been marvelous, and yet there are plenty of other vineyards that would doubtless pay as well if the same care and close selection were given in packing them for Eastern shipment. Mr. Stephens realizes a small fortune every year from 20 acres planted to the celebrated Tokay and Cornichon grapes. Among other varieties grown here are the Muscat, Black Prince, Morocco, and Emperor. Grapes of all kinds do remarkably well on the plain lands, the most wonderful instance of this kind being found at Florin. The vines are irrigated very easily and cheaply by means of windmills lifting the water, which is found in abundance at a depth of about 10 feet. At Natoma, in Sacramento County, may be found the largest vineyard of table grapes in the State. They are mostly of the Tokay variety, and always bring fancy prices in the East.

"Among other productions the fig is commencing to play an important part in the crops of Sacramento County. On the banks of the rivers this tree attains a great size and is remarkably productive. The common black fig requires absolutely no care or attention. The fig grows like the oak, and is equally vigorous, and when covered with its large green leaves and rich, handsome fruit is a very beautiful sight. The first crop is usually sold green, but the second is allowed to fall to the ground, and when sufficiently dried the figs are thrown into sacks and readily command from 3 to 5 cents per pound. The better varieties of the fig of commerce are now being introduced, and will doubtless soon take the place completely of the common black fig.

"Almonds do remarkably well and are very profitable. Among other products of this county are hops. According to one of the leading hop growers of the State, and a recognized authority, Daniel Flint, Sacramento County is unsurpassed for hop culture. He says that a crop of from 1,000 to 2,000 pounds per acre may be had the first year that roots or sets are planted, and it is a common thing to grow 2,000 or 3,000, and sometimes 4,000 pounds per acre from well-developed vines.

"The vegetable business is also a leading feature among the industries of this county. Hundreds of carloads are shipped every year of cabbage, onions, and potatoes. I think the growing of these crops can be very greatly increased with great profit to the growers. Beans of various kinds are very profitable on the Sacramento River lands, and are grown in very large quantities.

"I think the opportunities for successful investment of large sums of money are unexcelled in Sacramento County. Plenty of land can be found that is adapted to the successful culture of all the above-named fruits and vegetables; and better than all else, there is a first-class market for it when grown.

"Fifteen years ago it cost \$1,200 to get a carload of fruit through to New York in ten days' time. Since then every year the railroads have

improved to some extent the service on Eastern shipments. It is a fashionable thing to assail the railroad companies and to blame them for all that may appear to be wrong in the business of handling fruit, but I think it is only fair and in justice to the Southern Pacific Railroad Company to say that its managers have always shown great interest in the fruit transportation question.

"As above stated, there has been some improvement either in rates or train service made every year, and for the present season we are promised a daily fruit-train service from Sacramento City to all Eastern cities, to be run at freight-train rates, and on a schedule time equal to what was formerly the passenger-train time. In other words, the service that originally cost us \$1,200 per car will now be performed by the railroads for \$300 per car. We will thus be enabled to deliver fruit in New York City in eight days from the time it leaves Sacramento, and at a cost of 1½ cents per pound for freight charges. If the Southern Pacific Company, which has made splendid time to Ogden, can arrange, as I understand they are now trying to do, with the Eastern connecting lines, this favorable rate and time will be made and with the result of incalculable benefit to Sacramento County."

Sacramento's chief fruit products are in the line of peaches, prunes, plums, cherries, apricots, and berries. These are shipped chiefly to Eastern cities, San Francisco, and the canneries. About one half of the total output goes to the East. The larger part of this is marketed green, except such as is canned by the two canneries at Sacramento City. Fruit is sold to the canneries at Sacramento, Chips Island, San Francisco, and San José. For shipment to the East it is packed in standard shipping boxes and crates. To be sent to the canneries, it is packed in large boxes known as tomato boxes, with covers, each holding about 60 pounds. Peaches are sent in baskets holding from 22 to 25 pounds and in boxes of 20 pounds. Prunes for the San Francisco market are packed as peaches for the East are shipped, in crates of 20 pounds each.

The following is the output of fruit in Sacramento County for 1891:

	1891—lbs.
Apples	1,657,500
Apricots	3,755,000
Cherries	670,000
Figs	103,000
Peaches	28,931,000
Pears	26,326,000
Prunes	1,112,500
Quinces	122,500
Table grapes	20,420,000
Miscellaneous fruits	4,815,000
Total	87,912,500

The following are the prices paid last season and this for leading green fruits in Sacramento:

	1891.	1892.
Tragedy prunes, per crate	\$1 75	\$1 25
Pears, per 40-lb. box	75c. to \$1 00	1 25
Peaches, delivered, per pound	02	02¼

The area of fruit in Sacramento County is some 12,000 acres, of which 700 acres were planted during the season of 1891.

The larger part of the orchards, together with the new plantings, are along the Sacramento and American Rivers. The soil there is a deep alluvium, next to the river a deep, sandy loam, which becomes more shallow as it extends back from the river. This is underlaid by a hardpan from 1 to 2 feet in thickness; still farther back, the soil becomes a decayed vegetable mold, almost a peat, commonly known as "tule lands." This is very valuable for vegetables and the smaller fruits, when drained by levees and drainage pumps.

The Natoma Water Company have ditches for irrigation in the vicinity of Folsom and Natoma; above Sacramento the irrigation is mostly from wells. On the Sacramento River no irrigation is required. The lands generally are very damp and must be secured by levees from the high water of the Sacramento River. The ground being highest near the Sacramento, ditches are dug to conduct the seepage water eastward, and immense pumping engines throw the water over the Cosumnes levee. One pump in the Pearson district has a capacity of 130,000 gallons per minute, but the full capacity is seldom needed. These pumps are run from six to twenty-six weeks during the year, usually from seven to eight weeks. The action of the pumps can be reversed for irrigation, throwing back, if needed.

ACREAGE AND VARIETY OF FRUITS IN SACRAMENTO COUNTY.

Variety.	Acres in Trees.			
	Bearing.	Non-Bearing.	Total.	Plant of 1892.
Apple.....	29	10	39	3
Apricot.....	436	99	535	38
Cherry.....	123	37	160	5
Fig.....	38	96	134	40
Olive.....	87	30	117	13
Peach.....	1,970	900	2,870	267
Prune.....	680	403	1,083	63
Pear.....	1,942	650	2,592	183
Plum.....	650	37	687	12
Lemon.....	3	8	11	4
Orange.....	125	70	195	22
Nuts—Almond.....	126	132	258	43
Walnut.....	26	18	44	7
Raisins.....	400		400	
Table grapes.....	2,550		2,550	
Small fruits.....	870		870	
Totals.....	10,055	2,490	12,545	700

SAN BENITO COUNTY.

San Benito County lies 25 miles inland, and to the east of the town of Monterey; bounded on the north by Santa Clara County, on the east by Merced and Fresno, and on the south and west by Monterey County. It is about 70 miles in length, averages about 21 miles in width, and embraces an area of 1,056 square miles, or 676,000 acres. This county is inclosed on two sides by mountains—on the east by the Mount Diablo range, and on the west by the Gabilan Mountains. From these ranges the surface slopes to the valley of the San Benito River, which flows northwest-

erly through the middle of the county, and empties into the Pajaro River. A few small streams, the most important of which is Tres Pinos Creek, are tributary to the San Benito. A very large part of the area of San Benito is classed as mountain, but there are numbers of little valleys and much level land in the county.

The soil of San Benito may properly be divided into four classes, as follows:

First—About 25,000 acres of rich garden land. The soil is of a black sandy loam, and will produce in abundance any kind of vegetation, and is excellent for fruit. Upon this fertile land are raised the fine vegetables which supply local demands, and largely the markets of San Francisco.

Second—About 34,300 acres of first-class grain land, contained principally in what is known as San Benito Valley (the extreme southern portion of Santa Clara Valley). The soil is a black sandy loam, or adobe, with a blue or sandy subsoil, and holds moisture well. It is principally from this land that the large amount of grain usually shipped from this county is raised.

Third—About 46,000 acres of what is termed second-class grain land, situated in the foothills, and composed about equally of adobe and sandy soil. This land is not so strong as the valley land, but produces quite fairly, and in dry seasons is more sure of good crops than the richer bottom land. From this land is cut very fine hay, noted in San Francisco markets as "Hollister hay."

Fourth—In addition to 105,300 acres capable of producing vegetables and grain, there is a large amount of hill land which makes very fine pasture. More or less of it is connected with many of the ranches in the valley.

The largest single body of valley land lies in the northern part of the county, and forms the *southern* end of the Santa Clara Valley. Numerous valleys of smaller extent add their quota to the area of first-class land. Among these may be named the San Juan, Santa Ana, Quien Sabe, Los Muertos, Bear, Panoche, and Bitter Water Valleys.

San Benito County, situated midway between the San Joaquin Valley and the coast, has a climate tempered by both, avoiding the extreme heat of the former and the chilling winds of the latter. It is separated from the coast by the Gabilan range, but is yet near enough to the ocean to feel its tempering influence. Fogs are not of frequent occurrence, and during the summer months the ocean breeze finds its way every day through a mountain gap, rendering the climate very healthful and pleasant. The average temperature at Hollister, as given by the United States Signal Service, shows 59.5° for the year, the highest being 109° and the lowest 21°. Vegetables grow the year round, and the nights are always cool. The average precipitation is nearly 12 inches annually, which, it may be said, all falls between November and April. An average record for a series of years, kept at Hollister, shows the average by months as follows:

	Inches.		Inches.
January.....	2.62	July.....	0.00
February.....	1.96	August.....	0.00
March.....	1.93	September.....	0.08
April.....	1.20	October.....	0.65
May.....	0.40	November.....	1.30
June.....	0.22	December.....	1.42

These figures give the rainfall in the valley, but in the mountains they are greatly increased.

The rivers and streams that flow from the mountains bordering the county, together with numerous springs, furnish an abundant supply of water. No irrigating canals have been constructed, because they have not been found necessary; the generous rains of the winter and spring months give to the ground all the moisture needed. San Benito's topography is such that if any system were adopted for husbanding the water which runs off in the San Benito River and the Tres Pinos Creek a great portion of the valley lands could be irrigated at a small expense. There is a large area of the county in which artesian water is obtainable. In the San Felipe district alone there are a large number of artesian wells constantly flowing.

San Benito has been principally devoted to farming and stock raising, but of late years a great deal of attention has been given to horticulture, and with the most encouraging results. Large areas of land have been planted to fruit in the country around and tributary to Hollister. Apricots do especially well there, and in one orchard near San Juan there are 160 acres of fruit, including 2,600 apricots, 750 peaches, 1,400 pears, 300 cherries, 1,500 apples, 700 silver prunes, 150 figs, 2,600 prunes, 500 plums, 500 almonds, 250 chestnuts, 300 walnuts, 2,000 olives, and 15,000 grapevines. This orchard is now six years old and is paying handsome returns on the investment.

Of the fruit generally grown about Hollister, the principal varieties are: Apricots, prunes, pears, grapes, apples, cherries, walnuts, almonds, quince, strawberries, and blackberries. The leading varieties of each of these grown there are:

Apples: Green's Newtown Pippin, Gloria Mundi, Yellow Newtown Pippin, Rambo, Rhode Island Greening, Hubbardston's Nonesuch, Baldwin, Swaar, Russet, Winesap, Limber Twig, Twenty-ounce Pippin, Fall Pippin, Northern Spy, Smith's Cider, Yellow Bellflower, E. Spitzenberg, Roxbury Russet, Grindstone, Virginia Greening.

Peaches: Wager, Smock, Heath Cling, Orange Cling, Grove's White Cling, Old Mixon Free, Late Crawford, Snow, Salway, Lemon Cling, Grove's Red Cling, Briggs' Red May, Alexander.

Pears: Bartlett, Winter Nelis, Seckel, Flemish Beauty, P. Barry, Le Conte, Beurré Hardy, Easter Buerré, Keiffer's Hybrid.

Table Grapes: Black Hamburg, Flame Tokay, Muscat of Alexandria, Rose of Peru, Purple Damascus, Verdel, Red Chasselas, Muscatel, Sweetwater, Isabella.

Cherries: Governor Wood, Black Tartarian, Cleveland Bigarreau, Napoleon Bigarreau, Black Republican, May Duke, Early Purple.

Plums: Coe's Golden Drop, Imperial Gage, Green Gage, Yellow Egg, Jefferson, Washington, Bradshaw, Smith's Orleans, Kelsey Japan, Blue Damson.

Prunes: French, German, Fellenberg, Hungarian, Silver.

Figs: Smyrna, Black California, and White Ischia.

The chief fruit sections of San Benito County are, in order of importance, San Juan Valley, San Felipe Valley, Hollister, Bitter Water Valley, Priest Valley, and Gilroy. While little has as yet been done in the way of fruit growing on a large scale, there have been several large orchards planted during the past two years, and these are making a very thrifty growth, and enough has been done to show that when San

Benito enters the field as a horticultural county, she can produce a very wide range of very excellent fruits.

There are no shipments of fruit from this county, all that is produced being used for local consumption.

One of the oldest orchards in the State is found in San Benito, being the Old Mission orchard at San Juan. This was planted as early as 1785, and comprised pears, apples, olives, and grapes. Although it has been neglected and fallen largely into decay, there are still a number of the original trees standing; these are pears and olives, scattered about in promiscuous disorder.

After the Missions, the pioneer orchardist of San Benito was Theophile Vecchi, who planted a small orchard on the Gabilan range, with stock imported from France, in 1854. Among other pioneer orchardists of the county are Captain Buck, of San Felipe; Senator Flint, of San Juan; Marion Crow, of Hollister; William Palmtag, of Hollister, and W. H. Stone, of Piacines.

ACREAGE AND VARIETY OF FRUITS IN SAN BENITO COUNTY.

Variety.	Acres in Trees.			
	Bearing.	Non-Bearing.	Total.	Plant of 1892.
Apple	87	23	110	5
Apricot	181	47	228	12
Cherry	28	12	40	8
Fig	28	9	37	4
Olive	21	17	38	6
Peach	124	83	207	
Prune	427	275	702	63
Pear	104	58	162	17
Plum	9	7	16	2
Lemon	1		1	
Orange	1	2	3	1
Nuts—Almond	56	20	76	7
Walnut	35	9	44	3
Raisins	17		17	
Table grapes	12		12	
Small fruits	20		20	
Totals	1,151	562	1,713	128

SAN BERNARDINO COUNTY.

San Bernardino is the largest county in the State, comprising within its area 23,476 square miles, or 14,200,000 acres. It is bounded on the north by the State of Nevada and Inyo County, on the east by Arizona, on the south by San Diego, and on the west by Orange, Los Angeles, and Kern Counties. The greater part of this vast area is desert, the only arable land of consequence lying in the southwest corner of the county, surrounded by the Sierra Madre and San Bernardino Mountains on the north and east. These mountains are a continuation of the Sierra Nevada range, and at the San Gorgonio Pass meet the San Jacinto range, which, with the Santa Ana range, skirt the southern portion of the valley, leaving a perfect amphitheater, which opens on its west side toward the ocean. Within this valley are a number of buttes, some of which rise abruptly out of the plains.

Topographically viewed, this county may be considered an elevated

plateau or plain, occupied or traversed by numerous mountains, some of which stand in irregular groups or isolated masses, while others stretch out into long ranges, flanked by foothills, and having a generally north and south trend. This plain, from an elevation of less than 1,000 feet on the south, rises in the central and northern parts of the county to a height of 4,000 feet or more.

Scattered about between these higher mountains occur many volcanic cones, buttes, and clusters of broken hills, not more than two thirds of the entire area of the county consisting of level or nearly level ground. Foremost among these isolated masses is the rugged elevation known as Mount San Bernardino, which, standing in the southwestern angle of the county, lifts itself to a height of 11,600 feet above the level of the sea. It is precipitous on all sides, its declivities being rocky, and nearly everywhere difficult of ascent. For more than half the year the higher portions of this mountain are covered with snow, which melting, keeps the larger streams, having their source in it, well replenished until late in the summer, the most of them flowing the year round.

It is to this abundant supply of water, now all appropriated for irrigating purposes, that the country adjacent on the south and west is indebted for its unbounded fertility. From the forests on this mountain, the local demands for fuel and lumber are in good part met, the body of timber standing there being the largest and best found in the southern part of the State. Measured through its base in any direction, Mount San Bernardino extends fully 30 miles. One of the peaks of this mountain, though not the highest, constitutes the initial point of the public land surveys for Southern California; the base-line and meridian passing through it. This peak is very much lower than the extreme summit of the mountain, known as "Grayback," the crest of which extends 3 or 4 miles in an easterly and westerly direction.

A long, straggling chain of mountains, stretching southeast from the central San Bernardino group, having by some topographers been considered a continuation of this mountain, has so been designated on their maps, though to different portions of this chain local names have been given. Southeast of San Bernardino some 20 miles, and separated from it by San Gorgonio Pass, stands the San Jacinto Peak, its base extending over into San Diego County. Its top is only about 500 feet lower than that of the opposing mountain, which in many respects it closely resembles. Running out from this peak a high ridge extends far to the southeast, this ridge retaining the name of its culminating summit. San Jacinto, being so high and so nearly isolated, can be seen for more than 100 miles off on the Colorado Desert.

The San Gabriel Mountains, a high and nearly timberless range, extends from Mount San Bernardino, with which they are connected by an elevated ridge, 50 miles northwest; the point of lowest depression in this ridge being known as the Cajon Pass. Covered almost wholly with chaparral, and cut by deep cañons, these mountains present a gloomy and forbidding appearance. They are dry and barren, nor do they contain any more than a limited area of agricultural land. The dominating summit of these mountains is San Antonio Peak, 9,630 feet high, which stands near the line between this and Los Angeles County, in which the greater portion of this range is situated. This peak is a conspicuous object viewed from the north or the east, being visible a long way off in these directions.

The other mountains in this county stand off in the Mohave Desert; the Providence range, on its eastern border, being the highest and in other respects the most notable. This range extends north-northeast and south-southwest for a distance of about 80 miles, several partially disjointed mountain masses being included, and to some of which distinct names have been given, though the whole properly constitutes but one chain. In its culminating peak on the south, sometimes called Mount Edgar, this range reaches an elevation of 6,350 feet, many portions of it elsewhere being nearly as high.

A large portion of the Mohave and Colorado Deserts are found in this county, and reach from the base of the mountain ranges on the north and east to the Colorado River. No fruit of any kind or other vegetable products of use to man grow on these sterile plains.

The water supply of the valley is ample for all purposes. From every cañon in the range creeks and rivers find their way to the plains below. Like the streams in most mountain countries, many of them are dry beds in the summer and roaring torrents in the winter months. Many of them, however, are perennial, and these furnish the great supply for the irrigating system which has made San Bernardino County famous. Chief among these streams are the Santa Ana River, and Mill, San Timoteo, Temescal, City, Twin, Devil's Cañon, Cajon Pass, Lytle, Warm, Cucamonga, San Antonio, Rincon, and Chino Creeks, all on the southeast side of the range, and the Mohave River on the north. The latter river has its rise on the eastern slope of Mount San Bernardino and is finally lost in the Mohave Desert.

The soil of San Bernardino Valley, the only portion of interest from a horticultural point of view, varies greatly with location. At Highland it is a sharp gravel, with a large admixture of alluvium. It is easily worked and under water very fertile. At Redlands the soil, as the name implies, is red, characteristic of the foothill regions of the State. It is very largely composed of clay with an admixture of sand, and on the higher portions very gravelly. It is heavily impregnated with iron and potash, and rich in the constituents of plant-life. At Old San Bernardino the soil changes to a heavy black loam with streaks of adobe, and from there to the Santa Ana River are large alkali flats, the surface of which in many places presents the appearance of a snow-covered field. Riverside soil is generally a heavy clay, in some parts mixed with sand, getting gravelly toward East and South Riverside. Rialto has a sandy and gravelly loam, and Cucamonga is generally a very light sandy soil. Around the city of San Bernardino the land is generally strong adobe heavily impregnated with alkali. So heavily charged with alkali is a large portion of the land there that fruit growing has had to be abandoned, and along the line of the Arrowhead Railroad are seen large tracts where the experiment has proven costly to their owners, and the dead trees stand a dismal monument to their failure. Ontario has a sharp, gravelly loam, warm and fertile, and in the Terrace at Colton is found a rich deep loam in which fruit does exceptionally well. Along the river bottoms a cold, damp clay, not so good for fruit or for farm purposes, is found.

The climate of San Bernardino differs as widely as her soil and topographical features. In the northern plateau winters possessing almost the rigor of those of the East prevail. Heavy snows are not uncommon in the winter season, and severe frosts are frequent. South of the

mountain ranges a different climate prevails. At Highland frost is a thing almost unheard of; Redlands suffers little; Ontario, Riverside, and Colton are more subject to visitations, though not usually severe enough to do great damage; while the city of San Bernardino, lying in a low, damp situation, suffers more than most other sections of the county. The most disagreeable and costly feature of the climate here is the "northerners," which prevail to a great extent through the winter months and do great damage. Wherever orchards are planted it is found necessary to protect them from these destructive winds with wind-breaks of evergreens, and even with this protection orchards are sometimes very roughly treated.

The spring months are characterized by considerable foggy weather, not usually dense, and occasional hot days. The summer is hot. Sixty miles east from Los Angeles it is several degrees hotter, the thermometer frequently recording 104° to 110°. This heat, however, is modified by an ocean breeze which blows from two o'clock until sunset.

Rainfall in the different parts of the county varies with the topography. At Riverside the average annual precipitation will not exceed 8 inches; at Redlands much more; at San Bernardino, about 12 inches, and this amount increases as the mountains are approached. At Bear Valley there is rarely ever a less fall than 30 inches, and sometimes as much as 100 inches will fall in a season. On the desert the precipitation is very light; in some portions there is barely any rainfall. The rainfall for the season of 1891-92 at San Bernardino was:

	Inches.		Inches.
August .....	.91	May 1 .....	.17
September .....	.93	May 3 .....	.26
December	3.48	May 4 .....	.79
January	3.67	May 5 .....	.07
February	4.56	May 30 .....	.06
March	1.72		
April .....	.23	Total	16.85

For the number and perfection of her irrigation enterprises, San Bernardino takes front rank among the counties of California. It may be called the mother of irrigation, for there are found some of the oldest works in the State. Some of these were even constructed by the Mission fathers before American occupancy. Upon the purchase of the Rancho San Bernardino, in 1853, by the Mormons, a complete though somewhat primitive system of irrigation was at once developed. From that time until the present the system has grown, until to-day the whole arable portion of the county is a network of irrigation canals and service ditches. The first great irrigating work was the construction of the Riverside Canal in 1870, which took water from the Santa Ana River at the base of Slover Mountain, and delivered it through the Riverside District, a distance of 11 miles. The success of this work gave an impetus to others, and the North and South Fork Ditches of the Santa Ana were extended and enlarged. Afterwards the great Bear Valley Reservoir was constructed, and this was followed by the Gage water system. Most of the canals are cemented, or the water is carried in pipes to the land upon which it is to be used. The larger part of the Bear Valley water is piped. Redlands, Alessandro, and Perris are all under this system, and the water supply to all of these places is piped. Besides the numerous private canals there are five districts in San Bernardino County organized under the Wright Act.

These are Alessandro, Citrus Belt, East Riverside, Grapeland, and Rialto.

The following table shows the development of water in this county during the past ten years. The figures show the acreage capacity of the principal irrigating systems of the county:

Water Systems.	1880.	1890.
Riverside	5,000	10,000
Gage Canal		15,000
South Riverside		6,000
Ontario		5,000
Etiwanda	2,000	3,200
Cucamonga	500	10,000
Lytle Creek	1,000	10,000
North Fork Ditch	1,000	4,000
South Fork Ditch	3,000	4,000
Mill Creek		5,000
North Riverside Canal		7,500
Vivienda Pipe-line	3,000	5,000
Rincon Ditch		4,000
Chino Pipe-line		3,500
City Creek	500	500
Twin Creeks		3,000
Banning		3,000
Colton Terrace		2,000
Bear Valley Reservoir		28,000
Totals	16,000	128,700

The canals, reservoirs, and waterways of San Bernardino are all for irrigating purposes. There are a few mining ditches, but they are small, and are not assessed separately from the property to which they belong.

IRRIGATION WORKS IN SAN BERNARDINO COUNTY.

Name.	Miles.	Total Value.
Riverside—Warm Creek Canal	4 ⁷ / ₁₀	\$24,455
Riverside—Upper Canal	14	76,080
Riverside—Lower Canal	15	60,985
Gage Canal	12	54,000
Domestic Water Company	10	50,000
Hesperia Canal	6	12,000
Lugonia Water Company	10	50,000
Rabel Dam Ditch	2	9,240
Bear Valley	5 ¹ / ₄	10,250
Gage Pipe-line	4 ¹ / ₂	3,955
Riverside Pipe-line	37 ² / ₁₀	25,555
Bear Valley Pipe-line	14	33,000
North Fork Ditch	8	50,250
Bear Valley Extension Ditch	5	5,000
Green Spot Pipe-line	4	4,500
Alessandro Pipe-line	10	25,000
Riverside Pipe-line	13	29,990
Ontario and Etiwanda Pipe-lines	14	31,655
J. F. Houghton's Ditch	9	3,500
Cram & Van Leuven Ditch	7	21,100
Mill Creek Zanja	10	50,000
Meeks & Daley Ditch	1	3,500
Yorba Ditch	7 ³ / ₄	31,000
Jurupa Land and Water Company	4	12,000
Rancheria Ditch	3	5,000
Lytle Creek Water Company	7	20,000
Moreno Pipe-line	6	5,400
Rincon Ditch	4	13,000
Totals	247 ³ / ₂₀	\$720,415

Within the year last past upwards of \$750,000 have been expended in developing the various irrigation systems, and upwards of 150 miles of cement ditches, and vitrified, iron, and cement pipe-lines have been laid for the purpose of distributing water. Moreno, Alessandro, Riverside, Rialto, and South Riverside have been the principal points of activity in this direction. Not only has a great amount of money been expended in distributing water, but large sums have been expended in building storage reservoirs, principally by the Bear Valley Company and the Arrowhead Reservoir Company. The Bear Valley Company has begun work on its new dam which, when completed, will form a lake of water over 6,000 feet above the sea, about 12 miles in length, and with a capacity sufficient to irrigate 100,000 acres of land. In addition to this site several others have been located by the company, which will, when completed, increase the volume of water flowing through their irrigation system to an amount sufficient to water all the dry lands within reasonable distance. The Arrowhead Reservoir Company is preparing to build four dams, forming lakes of water sufficient to irrigate all the land from San Bernardino to Ontario, a plain 20 miles in length and 10 miles wide. A large force of men has been in their employ all summer building roads to the mountains, and several parties of engineers have been busy in surveying the reservoir sites and lines for the distributing canals, and there is every reason to believe that this company will be able to deliver water early in 1893 upon the dry plains.

San Bernardino produces most of the deciduous fruits. Apples and pears do well in the mountain region. Cherries and many of the small fruits are not found profitable. Prunes do well, and much attention has been paid to them of late years. Peaches and apricots also do well. The great industry of San Bernardino, however, is the growth of citrus fruits, and more oranges are exported from there than from any other one county in the United States. It was known that oranges would do well in this county early in the sixties, and several trees were bearing at Old San Bernardino at that time. They were regarded as a curiosity, however, and no attention was paid to citrus culture as an industry until Riverside took up the work in 1870. It was there that citrus culture had its start, and that amid untold opposition on the part of the older settlers, who regarded the Riversiders as visionaries, impractical dreamers, who would certainly fail. But Riverside made a success, and from her as a center, the citrus industry has spread until it now covers every available part of San Bernardino Valley, and has become an important factor, not alone in the history of Southern California, but of the whole State.

The chief sections of San Bernardino are, in order of importance, Riverside, Redlands, Ontario, Highland, Colton, South Riverside, Old San Bernardino, Rialto, and the country surrounding the town of San Bernardino.

The principal fruits produced are those of the citrus family, San Bernardino having attained a reputation over the entire Union for the superiority of her oranges. It is estimated that one half of the orange shipments from California are taken from San Bernardino County. Riverside supplying by far the greater part of these.

The shipments of oranges and lemons from Riverside for the season of 1891-92 foots up a total of 402,030 boxes, or 1,406 carloads. The

larger part of these were shipped over the Atchison, Topeka, and Santa Fe Railroad, and found a market in Chicago, St. Louis, and New York.

A heavy wind storm which swept over the whole of Southern California on the 10th of November, 1891, through the San Gabriel Valley, and over the Riverside Plains, caused considerable loss in the orange crop of this section. This was not so severely felt at Riverside as it was in the San Gabriel Valley, but was followed by a severe frost on Christmas night, which injured the Riverside crop to a greater extent than it did that of the San Gabriel Valley. The result of these two climatic afflictions was to very largely reduce the output of oranges and lemons in this district, a very large portion of the Riverside crop being a total loss. In consequence, the shipments from this district were very much lighter than in the preceding year.

The shipments of the season of 1890-91 from Riverside were 1,446 carloads, showing a falling off in 1891-92 of 6 per cent, despite the fact that numerous young orchards came into bearing that year. The prospects at the present time are for a very largely increased output during the coming winter. The trees are all heavily laden, and a very large number of new orchards are coming into bearing over the whole district, and from present appearances, the shipments of the coming winter will be increased nearly 25 per cent over those of the past season.

The extent of damage done by the heavy wind storm and severe frost of last season, is shown from the fact that the export of oranges for 1890-91 from Southern California was 4,593 carloads, and the total export for the season of 1891-92 was reduced to 2,809 carloads. The inferior quality of much of the fruit this season had a demoralizing effect upon the market, and, in consequence, much of the better fruit was sold at very low prices.

The following statement will show the export of oranges from Riverside for the past ten years:

	Carloads.		Carloads.
1880-81	15	1887-88	725
1881-82	42	1888-89	982
1882-83	45	1889-90	1,500
1883-84	50	1890-91	1,446
1884-85	456	1891-92	1,406
1885-86	506		
1886-87	375	Total	7,548

Ontario, though much younger than Riverside in the citrus industry, is already making a very considerable mark in that line. There is a very large extent of excellent citrus land in the vicinity of Ontario. The orchards are well kept and the industry is a very promising one. Large shipments have been made from this section.

The orchards in this district are young, the acreage and bearing being comparatively small. The first shipments of fruit in carload lots were made in 1890.

Several very extensive companies have been organized for the cultivation of citrus fruits at Alessandro, Redlands, North San Bernardino, and other points. One of these, the "Mount Vernon Orange Grove and Fruit Company," organized May 9, 1891, with a capital stock of \$375,000, was projected for the purpose of planting a large area of land north of the town of San Bernardino. Seventy-five acres were planted in 1891 to budded orange trees. It was the intention of the company to plant 200 acres last spring, but owing to the severe weather of last

winter, they were prevented from doing as extensive work on this project as was originally designed. It is probable that it will be carried out during the coming season.

Very extensive planting has been done at Alessandro, Marino, Rialto, Cucamonga, Etiwanda, East Riverside, South Riverside, and in the vicinity of Redlands, Crafton, and Old San Bernardino. These orchards, when they come into bearing, will very largely increase the output of citrus fruits from this section.

Chino is another new district. Comparatively little attention has been paid to fruit in this district, the beet sugar industry overshadowing all others. There has, however, been a healthy growth in the orchard industry, and a large number of trees have been planted. The plant of new trees in this district during the season of 1892 was 147 acres, divided as follows:

	Acres.		Acres.
Oranges.....	12	Walnuts.....	12
Olives.....	44	Mixed.....	36
Apricots.....	10		
Peaches.....	5	Total.....	147
Prunes.....	28		

The total acreage of trees on the Chino ranch is given as follows:

	Acres.		Acres.
Oranges.....	102	Figs.....	56
Prunes.....	152	Pears.....	15
Peaches.....	22	Mixed.....	116
Apricots.....	14		
Olives.....	54	Total.....	612
Walnuts.....	81		

In addition to citrus fruits, all the districts of San Bernardino County produce very largely of the deciduous fruits. Prominent among these are peaches, prunes, and apricots. Pears are grown to a more limited extent, and apples are grown in a few places on the mountains, no large orchards of either apples or pears being found in the valley.

The deciduous fruits find a sale at the local canneries or are dried by the growers, and exported in a dried state.

A very large area is also planted to raisin vines, and the growth and packing of raisins is an industry second only to that of citrus culture in this county.

The prune is fast coming into popular favor, and a very large quantity of land has been set to prune orchards in the past two years. Prices last season ruled low, the following figures being the prevailing rates paid for various fruits:

Navel oranges.....	\$2 00 to \$2 50 per box.
Other budded varieties.....	1 25 to 1 75 per box.
Seedlings.....	75 to 1 25 per box.
Raisins.....	2 00 to 4 25 per box.
Prunes (dried).....	08 per pound.
Prunes (green).....	30 00 to \$50 00 per ton.
Peaches (green).....	20 00 to 30 00 per ton.
Apricots (green).....	17 50 to 24 00 per ton.

Prices for the present season ruled higher, and deciduous fruits sold at the following figures to the canneries or the evaporators:

Prunes.....	\$40 00 to \$60 00 per ton.
Peaches.....	20 00 to 30 00 per ton.
Apricots.....	18 00 to 24 00 per ton.

The following statement gives the exports from the Ontario district, over the Santa Fe and Southern Pacific Railroads, by months for the year 1891:

Months.	Oranges and Lemons, Boxes.	Raisins, Boxes.	Green Fruit, Pounds.	Dried Fruit, Pounds.
January.....	190	240		2,200
February.....	130	260		1,980
March.....	2,980	180		870
April.....	1,252	160		1,240
May.....	372		1,200	330
June.....	90		6,300	240
July.....	76		19,430	600
August.....	84		63,725	43,360
September.....	62		71,030	22,110
October.....	58	405	102,220	68,785
November.....	130	5,388	118,245	171,665
December.....	480	4,535	25,690	19,740
Totals.....	5,904	11,168	407,840	333,120

This, reduced to carloads, gives:

Oranges and lemons.....	21
Green fruit.....	20½
Dried fruit.....	17
Raisins.....	11½
	70

For the present year the total shipments of fruit from this district will probably exceed one hundred carloads.

Redlands is another important citrus section that has lately come into notice, and added very largely to the total output of citrus fruits from Southern California.

In 1890 there were 1,500 acres planted to oranges in this district; last year 1,200 acres were added to this, and, in the spring of the present year, this was increased by 1,500 acres.

For the seasons of 1891 and 1892 Redlands shipped 186 carloads of oranges.

Not over 5 per cent of the trees in this district are yet in bearing, and none, even of the older orchards, have yet reached full bearing capacity.

The deciduous fruit crop this season is short in San Bernardino County, as elsewhere. Peaches yield about 75 per cent, apricots will fall below 50 per cent, and prunes are almost a total failure. The citrus fruits, however, are in excellent condition, and will return a very large crop.

ACREAGE AND VARIETY OF FRUITS IN SAN BERNARDINO COUNTY.

Variety.	Acres in Trees.			
	Bearing.	Non-Bearing.	Total.	Plant of 1892.
Apple.....	107	115	222	99
Apricot.....	1,113	441	1,554	297
Fig.....	102	260	362	161
Olive.....	127	185	312	83
Peach.....	1,948	142	2,090	142
Prune.....	351	1,112	1,463	268
Pear.....	345	57	402	57
Lemon.....	436	567	1,003	217
Orange.....	26,585	9,652	36,237	3,050
Nuts—Almond.....	57	—	57	—
Walnut.....	131	70	201	50
Raisins.....	4,970	—	4,970	—
Table grapes.....	274	—	274	—
Small fruits.....	89	—	89	—
Totals.....	36,635	12,601	49,236	4,424

SAN DIEGO COUNTY.

San Diego, the southernmost county of the State, is bounded on the north by Orange and San Bernardino Counties, on the east by Arizona, from which it is separated by the Colorado River, on the south by Lower California, and on the west along its entire length by the Pacific Ocean. It is, with the exception of San Bernardino, the largest county in the State, having an area of 14,968 square miles, or 9,580,000 acres.

Much of this area is a barren waste, being included in the Colorado Desert, which in places is several hundred feet below the level of the ocean. San Diego is divided into two regions, as opposite to each other as though they were separated by the diameter of the earth. East of the San Jacinto and Cuyamaca Mountains lies a broad expanse of arid waste, treeless, waterless, and forbidding, a region where the temperature in summer frequently rises above 120°, and where the only vegetation found is the cactus, the mesquite, and greasewood; a region of dry lakes, bald granite hills, alkali flats, and parching sands. The country west of these ranges is the reverse of all this. The western slopes of these ranges are interspersed with numerous fertile valleys and mesas, where can be grown almost anything that can be found in either the temperate or semi-tropic zones. From the mountains to the ocean the country is broken and hilly, the hillsides generally free from rock and not too steep for cultivation. Among the numerous fertile valleys of San Diego, the El Cajon is justly celebrated for its fertility. The Otay country is rapidly becoming an important factor in San Diego's wealth; Oceanside, Lakeside, San Jacinto Valley, Escondido, Elsinore, Poway, Linda Vista, the National Ranch, Chula Vista, and Sweetwater, are the more prominent of the productive districts of San Diego County. The county is intersected by numerous streams, most of which are raging torrents in the winter and beds of sand in the summer months. The San Diego River, which is the most important of these, flows beneath the surface and percolates through its sandy bed to the sea. Elsinore Lake, the largest body of fresh water in Southern California, lies in the northwest corner of the county, and it serves as the drainage basin for the San Jacinto Plains.

San Diego abounds in mesa lands of a reddish color and very fertile. Near National City is a red soil, quite clayey. The slopes of El Cajon have loams much resembling Riverside lands. The Otay country is largely a black adobe, very strong, and carrying all the constituent elements of plant growth. In the Jamul and Janal regions the soil is divided between a black and gray adobe and a sandy loam. In the San Jacinto Valley and plain the prevailing characteristics of the soil are a warm sandy loam, intermixed with clay in some portions, and preserving the red color of the foothills as it recedes from the valley. The Colorado River bottoms have a soil easily worked, highly productive, and not likely to suffer from overflow. Alkali is not found in hurtful quantity, and good results may be expected when the waters of the Colorado are available for irrigation. In some sections of the desert artesian water has been found, and many hope to ripen the earliest fruits in some of those more favored localities in the desert.

The celebrity of San Diego's climate is world-wide, and probably for health and pleasure it is unsurpassed in the world. On the immediate coast it is remarkable for its equability, but for fruit growing the climate of the interior valleys, where the mercury reaches a higher elevation than on the coast, is to be preferred.

The climate of the coast region of this county is most desirable. For healthfulness and uniformity it ranks with any in the world, and has made this section a noted resort for invalids. The rainfall of the valleys and low mesas is light, and there are few cloudy days. Flowers bloom the year round, and nearly every day is the realization of ideal weather. The records of stations near the coast show that for fifteen years there has been an average each year of 184 clear days, 136 fair, and but 45 cloudy. The average number of days in each year on which rain fell was but 34. The average annual rainfall for fifteen years, near the coast, has been but 10 inches. The coast climate of this locality is entirely free from what is known in the East as the "heated term." In eighteen years the thermometer went above 90° only fifteen times, and only reached 86° twice a year on an average. The lowest mid-day temperature is 55°, and this for only a few days in the winter. The lowest point for the whole winter is 32°, or once in three or four years 28°.

Irrigation is the great want of this county, and to supply this want a number of irrigation projects have been started. Five irrigation districts have been organized under the Wright Act; these are the Elsinore, Escondido, Fallbrook, Murietta, and Perris, covering an aggregate of 74,394 acres. On the subject of irrigation in San Diego, Theodore S. Van Dyke writes:

"In the line of water development San Diego County has made more progress in the past year than ever before. The actual construction has not been as great as when the San Diego River flume and the Sweetwater dam were building, and though construction has been limited to the northern end of the county, there has been an awakening of the people to the importance of irrigation and the immediate development of the great resources that exist in that line that will, in the end, be far more valuable than the mere building of works in a few places.

"Few things have shown this more clearly than the vote of Fallbrook. In a district of 12,000 acres \$400,000 in bonds were voted by a majority of fifty in a vote of ninety. If any section of this county ever had a right to boast of what it could produce without irrigation that

section was Fallbrook. With about double the rainfall of the rest of the coast region, with a subsoil so retentive of moisture that good wells can be had almost everywhere in a few feet, and fair crops of corn raised without a drop of rain after planting, with a top soil so deep and rich that the most fastidious wiseacre from a western prairie has never questioned its virtues, with a climate that was all that could be desired for the choicest products that can be grown on the coast at all, it seemed absurd, for a long time, to talk of Fallbrook needing water. Yet its people have been among the first to recognize the inevitable and bow gracefully to it, instead of fighting it off several years and keeping themselves behind in the race of progress. They have found that no matter what they can do without irrigation the control of water and its proper use, with intelligent cultivation, so far excel all tillage without it that all other methods must go, and the sooner the better. It is no derogation from other sections to say that this Fallbrook Irrigation District will have the cheapest and surest water supply of any district in the county. So heavy is the average flow of Temecula Creek during the whole year that but a small amount of water need be reservoired, and all those things that need only spring or winter irrigation can have all they need without drawing on the storage at all. The entire line will be but 14 miles long, over a country presenting no engineering difficulties, and the cost has been carefully estimated from surveys already made. Fortunately for the district, the cost will be so low that it can build its own waterworks; a thing that many other districts cannot do, but have to buy from companies or divide with other districts.

"The almost unanimous vote for \$1,000,000 in bonds in the Linda Vista district, on the same day as the vote at Fallbrook, was not so remarkable, because it has always been conceded that the coast mesas need water. All along the coast there has long been a desire for water. The only drawback has been a chronic unwillingness on the part of the majority of the owners to paying, either in money or dry land, anything near the dead cost of getting the water to the land. Too many wanted the water, not to raise crops of fruit, but crops of tenderfeet, and long cherished the fond hope that some benevolent gentlemen would come along with dropsical pockets and build an aqueduct beside their lands to enable them to sell to strangers at boom prices. Investigation of the cost of water, which should have been made long ago, has banished this hope, and now the people are ready to pay full value for it. Although this leaves some sections years behind where they might have been had they listened to those who had studied these matters, it is still a vast stride in progress; for when once a people resolves that it must have something, cost what it may, and has the land ready to make its resolutions good, the road will speedily be found. Linda Vista will stand second to none of the irrigation sections of the county when once watered, which can be easily done at a cost which the land can well afford to pay. This district is rich in a broad and beautiful sheet of land, which has in other places been proved to be as fertile as any of the best fruit lands of the State when well irrigated. But it is richer still in climate, and richer yet in the temperature of its soil. The difference of a few degrees in the average temperature of ground during the months of fall and winter, when the orange and lemon are making their most important growth—that of ripening up the crop—is one little

thought of by the majority of land buyers, but one that means many dollars' difference in the profit to the acre.

"Upon Linda Vista killing frost is practically unknown, and the ground never gets chilled much in winter nights. Its uniform climate, never too hot, never too cold, never too dry and never too moist, for any length of time, makes it especially adapted to the lemon, while it is far enough from the sea to raise oranges that can scarcely be distinguished from the best of California, as well as all other products that can be grown on this part of the coast at all. Linda Vista will get water, and get it about as soon as any of the new districts. When it does, its 40,000 acres lying so convenient to San Diego Bay will see a rapid rate of settlement.

"With the same advantages possessed by Linda Vista, the new district of Jamacha, containing some 22,000 acres, east of San Diego, is also well blessed. It has a large area of the same warm soil, over all of which water may be easily run from two different sources. It has lately bought the reservoir site and water rights of the San Miguel Water Company, and intends to own its own water.

"The same advantages in the way of soil and climate are also shared by the new district of Otay, organized in November last. This contains over 40,000 acres, nearly all mesa, which means always warm land. Neither in this district nor in Jamacha have any bonds yet been voted, but the majority in each on the question of organization of the district settles that question beyond doubt. An abundant supply of water for this district, as well as for the Jamacha, lies in the great mountains of the interior, which can be brought down at an elevation that will reach the highest point of the beautiful and fertile table-lands. The watershed of Cottonwood Creek, the north fork of the Tia Juana River, is one of the largest and surest sources of supply in the county, and the bulk of its waters can be stored in reservoirs from the mountain park of Pine Valley down to near the line of Mexico. The reorganization of the Tecarte Water Company, which has thoroughly surveyed this watershed and its possibilities, indicates that the supply of this district may be speedily developed.

"Under works already completed, the settlement has been rapid enough to show what will happen in every section as soon as water is introduced. Under the Sweetwater dam at Chula Vista in Paradise Valley, and up the Sweetwater Valley and adjacent slopes, many new settlers have bought and begun improvements within the year, and everywhere the water touches the soil the same results are seen that have so long been proved possible in a few places with windmills. Everything here is in line with the progress in three counties adjoining. Everything goes to show that where the water ditch sparkles over the smoothest plain, and winds along the roughest hillside, there is no dullness and no lack of prosperity. Although the rate of settlement may not reach that of sections having more immediate proof on all hands of what water can do, there is more than enough to show that the claim long made in the adjoining counties, that a small farm with water was better than one ten times its size without water, was well founded, and that it applies to this county as well as to any of the others.

"The same is true of the lands lying under the San Diego flume. Many of the land owners under that system have kept themselves years behind by listening to wise men who, like a philosopher of old, evolved

their knowledge of water out of inner consciousness. They, too, thought that water should be sold far below the cost of production to make dry lands worth boom prices; and the wise counselors told them that they could get it at their own figures through the law. The result has been that they are paying for it twice what they could have got it for four years ago, and four times what they could have got it for five years ago when a struggling enterprise was trying to find friends. The effects of its use have, however, been the same as elsewhere, and in El Cajon and in Spring Valley, near the line of the flume, a great number of tracts have been sold during the year with water, all of which have been planted, mostly in oranges and lemons.

"Those who want to study the effect of a few degrees difference in the temperature of the ground, should see the 10-acre tracts under the water of this flume at La Mesa, where many have been improved during the year. A careful study of these will satisfy anybody that the warmth of the ground, aside from the question of safety of the vegetation above ground from killing frosts, will in the long run, and for almost any kind of trees, more than overbalance all disadvantages, whether imaginary or real. The stranger who sees this land without water naturally doubts its capabilities. But all it needs is water and work. San Diego Bay is surrounded for many miles with just such warm lands, and probably has more of it than all the rest of the State. Nearly all of it can be irrigated, and when that is properly done it will be the cream of the State for lemons, and as good as any of it for oranges and other things.

"The irrigation district of San Marcos has just been organized, the resident and non-resident owners being almost unanimous in favor of it. It will join with the Escondido district in getting water. This will undoubtedly come from the San Luis River, and the terms of a contract have already been agreed on between the Escondido district and a responsible New York firm for the watering of that district, which will, no doubt, be extended to San Marcos. San Marcos and Escondido are united in interest by situation, climate, and trade, and largely by ownership, and they will join forces in carrying out the work themselves if all else should fail. There are no better sections of the county than these two, and threaded as they are by a railroad, and in the center of trade of a large area of surrounding country, their future is assured from the day active work on the construction of waterworks is begun. The attractive features of Escondido have made its lands sell at a remarkable rate, in spite of the lack of water, so that it requires no prophet to foretell the result when water is added. The same is the case with San Marcos. In the way of actual construction and bringing of water to distant ground, the northern part of the county is the only part that can boast of much progress for this year.

"The great dam at Hemet Valley has been under rapid construction during the year, and has now reached a height of about 50 feet. When finished this will be an immense structure, and will irrigate many thousand acres of the fertile plains of San Jacinto, in addition to the thousands now owned there by the company. The watershed is on the high mountains of the interior, where rain is always certain, and the dam will make a lake beside which many boasted reservoirs in other lands will look small. The machinery for the preparing and delivering of the stone and concrete for this dam is perhaps the most perfect ever seen, and the

huge blocks of solid granite that are lifted into place like brick in the hands of a mason, will form with the concrete that is rammed between them with steel rods, a solid mass of stone that will defy the siege of ages.

"It is not often that the best energies of one county are used to benefit another, especially in this progressive State; but the fact is that the Bear Valley Irrigation Company is now doing, and will continue to do, more for this county than even for the splendid county of San Bernardino, where its works and business offices are located. Designed originally for only a small part of its own county, it has made not only the wonderful prosperity at Redlands, but in opening up new territory at Alessandro has found an easy way over the border upon land in this county whose seductive influences it has found impossible to resist, especially when they lay in the direct line of conquest.

"The portion of the great plains of San Jacinto that lies in this county is so like in every respect to the fertile margin that lies within the county of San Bernardino, and on which the prosperous settlement of Alessandro is situated, that the carriage of the waters of the Bear Valley Reservoir beyond the point first intended resulted as a matter of course. So the rich plains that surround Perris came in quite naturally for some of the water, and that district of 22,000 acres was soon provided with a contract, and the main pipe for the delivery of the water is now at the edge of the district. This region has the general characteristics of Riverside, but a few miles away, and young orange trees that have stood the coldest weather of the last five years show that the winter climate is as safe for them as is the summer. Not less important than the entering of this county is the action of the Bear Valley Irrigation Company since, and it may now be considered the largest and best of our home companies, though belonging really to another county. The purchase of the thousands of acres that form the great laguna of San Jacinto, and the raising of its mouth by a dam, together with the securing of the rights to water on the Whitewater and another reservoir site in the Potrero of San Jacinto, mean nothing less than the watering of vast tracts of this country south of Perris, for the water can go nowhere else after crossing the line of hills east of Alessandro. The fertile slopes that surround Elsinore Lake and the rest of the lands that are included in that irrigation district, the validity of whose organization has been lately confirmed by the Court, will, before long, begin to smile under the influence of its waters, and they will be extended down to where Murietta spreads out over the broad plain that needs nothing but water to cover it with prosperous places."

Artesian water is found in the San Jacinto Valley, and a number of wells have been sunk. One of these wells flows, by actual measurement, 15,000,000 gallons of clear, pure water every twenty-four hours. Through a 7-inch pipe it throws a stream 27 feet high, from a nozzle 2 inches in diameter.

San Diego has as wide a range of productions as she has of soil and climate, and nearly every kind of fruit, from bananas and pineapples to Chickasaw plums and huckleberries, can be found represented there. In the higher mountain regions apples are grown, and some fine fruit is produced; pears, plums, and cherries do well in this region also. On the lower mesas and valleys oranges, lemons, apricots, peaches, prunes, and other deciduous fruits do well. Near and at Old Town are some of

the oldest olive trees in the State, while at National City, Hon. Frank A. Kimball has one of the largest olive orchards in California. The guava, Japanese persimmon, cassava, India rubber, camphor, and numerous other tropical trees have been tried and all thrive well, where the conditions are favorable.

In the vicinity of Julian apples have been grown upon five-year old trees in these mountain orchards that weighed a trifle under 3 pounds each, and from 20 to 30 ounces are not uncommon. There are trees within 3 miles of the city of Julian, the metropolis of the mountain belt, and within a few hundred feet of the summit of the great mountain divide, that have been known to produce a ton of apples to the tree, and these trees but twelve years from time of starting. Again one meets with frequent instances where these apple orchards are yielding their owners from \$300 to \$500 per acre, and trees not as yet in full bearing.

In the Cajon Valley last year there were made 2,600,000 pounds of raisins from a little over 3,000 acres of vineyard, from which a revenue of nearly \$100,000 has been derived. In this valley Mr. S. M. Marshall has a young orchard, planted three years ago, which contains 4,000 orange trees and 3,000 lemon trees of the most approved sorts. There are more than twenty varieties of oranges, the Navels, Malta Bloods, and St. Michael taking the lead. In lemons the leading are Villa Franca, Lisbon, Eureka, and Bonnie Brae. Besides the above there are 2,000 olive and 1,000 assorted fruit and nut trees—in all about 10,000 trees—and in nursery about 60,000 orange and lemon trees, budded to choice varieties. The orchard trees are two and three years old and show considerable fruit. Mr. Marshall says that an inspection of his orchards will convince the most skeptical that El Cajon Valley can produce citrus fruits equal in every respect to those grown in any other part of Southern California. He intends to extend his orchard the coming season, but is satisfied with his present vineyard of 125 acres.

Two large packing houses have been built, to meet the needs of the increasing raisin business in El Cajon, one by R. C. Allen, on a portion of what was known as the El Cajon Vineyard tract, and the other by J. T. Gordon, on his large ranch in the upper end of the valley. There are now five large packing houses and several smaller ones. Improved machinery has been introduced in all of the large houses for stemming, cleaning, and grading raisins.

In Poway almost every known fruit has been successfully tested except cherries, currants, and gooseberries, which require a higher elevation. The area in deciduous fruits is about 160 acres. While oranges and lemons are not produced beyond the requirements of local demand, and until better facilities for irrigation are developed, it is not deemed wise to greatly enlarge this branch of fruit culture; it is sufficiently proven that a considerable portion of the valley is admirably adapted in soil and climate to their production, and in sheltered nooks even the lime will succeed.

In 1869, J. M. Asher, now of El Cajon, and George Hazard, of San Diego, planted a few deciduous trees in Paradise Valley, the first ever planted by the hand of man on National Ranch, a tract of nearly 27,000 acres. Mr. Early, of San José, planted a few orange seeds as a doubtful experiment. The next year, Mr. Menzer put in the ground a few grape cuttings, it being the pioneer vineyard in this part of the county. In 1871, from a transplanted lemon tree, he produced one lemon, which

W. C. & F. A. Kimball took to New York as an indisputable testimony of the unequalled soil and climate of San Diego County. This was the county's first citrus fair. The progress of Paradise Valley has been steady and sure. During the past two or three years large areas have been planted to citrus fruits. The citrus area of this section has been largely increased the past season.

Lindsay & Trowsell write of the region around Escondido as follows:

"The apricot crop was light, but the fruit excellent—much better than last year. Peaches were superb; and as to size, beauty, quantity, and flavor, surpassed any others marketed in Southern California. Apple orchards round about have also yielded abundantly.

"The fig industry has also received a great deal of attention in this region. The trees grow and yield abundantly without irrigation, and the fruit is all that was ever hoped for by the most sanguine. Those put up this year have found a ready sale at from 10 to 15 cents per pound.

"Although few of our prunes are yet in bearing, a large acreage is coming on, and which is being largely increased each year. It has been thoroughly demonstrated that this is the home of the prune, hence the tendency to plant largely.

"Olives are also great favorites with our people, and the acreage planted is much larger than that of some other products: The trees are doing splendidly without irrigation, and some of them are now large enough to show what can be expected. An orchard of forty acres was set out the past season.

"As regards oranges and lemons, some of the finest young groves from one to six years old are growing and bearing in and about the Escondido Valley. Where proper locations are selected they do fully as well as in any of the brag orange-belt sections of Southern California, and the trees and fruit are here to speak for themselves.

"The Muscat raisin grapes grown in this and surrounding valleys have no equal in Southern California, as was fully attested this season, and consequently, owing to splendid drying weather in the curing season, our raisins are the very finest on the market. The crop will more than double that of last year.

"Wine grapes in the mountains and foothills were abundant; in fact, those engaged in the wine and brandy business had more grapes than they had made calculations on handling, notwithstanding their preparations for a largely increased yield. And it is proper to add that all of our grapes are grown without irrigation.

"We are also raising and marketing guavas, and the manufacture of jelly from that rich fruit is now receiving attention from several successful growers.

"Within the past two years large plantings of almonds and English walnuts have been made, and the young trees exhibit a thrifty growth."

Among the more prominent fruit districts of San Diego are Chula Vista, Otay, Julian, Escondido, Spring Valley, La Mesa, Delmar, El Cajon, Elsinore, Sweetwater Valley, and National City.

San Diego being in the southern range of counties, is prominent as an orange-producing county, and the citrus fruits form the larger part of her orchard products. In addition to these, large quantities of apricots, peaches, and prunes are grown. Of late years considerable attention has been paid to the cultivation of the guava, and of this fruit, San Diego produces more than any other county in the State.

A very large part of the acreage has been set out within the past two or three years, and there are few old orchards in San Diego County. Some of the oldest there are found in El Cajon and Sweetwater Valley. One of the largest orchards in the State is that owned by Hon. Frank Kimball, of National City.

Citrus fruits do well in all the interior valleys, and deciduous fruits thrive luxuriantly over the entire county.

There has been a very large number of new orchards planted in the various districts, of which returns have been made from the following:

Districts.	Acres in Fruit.	Planted in 1891.
Valley Center.....	500	200
Palm Valley.....	385	120
Chula Vista.....	2,500	180
Otay.....	250	130
Dulzura.....	300	60
San Jacinto.....	1,500	400
Julian.....	640	100
Elsinore.....	400	100
Cuyamaca.....	194	160
Lawson Valley.....	150	60
Totals.....	6,819	1,510

While these do not cover the entire county, the figures given serve to show the rapid increase of orchard planting in San Diego County.

The citrus fruits of San Diego are boxed and shipped via the Atchison, Topeka, and Santa Fe Railroad to the Eastern markets. The deciduous fruits are generally dried by the growers, and sold to Los Angeles and Eastern packers.

San Diego is famous for the superiority of her lemons, and a very strong impetus has been given to this industry of late. Some of the finest lemons produced in California are grown in San Diego County.

ACREAGE AND VARIETY OF FRUITS IN SAN DIEGO COUNTY.

Variety.	Acres in Trees.			Plant of 1892.
	Bearing.	Non-Bearing.	Total.	
Apple.....	705	45	750	45
Apricot.....	776	185	961	85
Cherry.....	10	6	16	6
Fig.....	154	137	291	20
Olive.....	735	328	1,063	150
Peach.....	608	185	793	23
Nectarine.....	11		11	
Prune.....	536	140	676	95
Pear.....	537	54	591	12
Plum.....	201	13	214	13
Quince.....	6		6	
Lemon.....	3,509	1,266	4,775	467
Orange.....	626	404	1,030	34
Nuts—Almond.....	28	46	74	46
Walnut.....	389	178	567	31
Raisins.....	3,454		3,454	200
Table grapes.....	510		510	306
Totals.....	12,795	2,987	15,782	1,533

SAN FRANCISCO COUNTY.

(City and County.)

San Francisco is the chief commercial city of the State of California, and the metropolis of the Pacific Coast. The county has little other territory than that covered by the city, and although the smallest, it is the wealthiest, most influential, and most important county of the State. Its area is 42 square miles, or 26,681 acres. Its topography can be described as the northeastern portion of a peninsula, having an average width of 15 miles and a length of 30. It is largely composed of low, sandy hills, with others of considerable height and of rocky formation. Its boundaries are the Golden Gate on the north, San Mateo County on the south, the Pacific Ocean on the west, and the bay of San Francisco on the east.

The one great feature of San Francisco, and the pride of California, is its bay. Forty miles of the bay lie south of San Francisco, and 25 miles extend north. Suisun Bay, connected with and extending east of San Pablo Bay, is 20 miles long. The average width of San Francisco Bay, as a whole, is 8 miles, the bay shore-line being over 300 miles in length. The two great rivers of the State—the Sacramento, draining the whole of the northeastern portion and the great valley of the same name, and the San Joaquin, flowing nearly the whole length of the valley whose name it bears, and having for a drainage area the vast Sierra range—unite their waters in Suisun Bay, and empty into San Francisco Bay.

The climate of San Francisco is very uniform; extremes of heat and cold are unknown. The mean temperature for July is 58.80°, for January 49.30°. It is a cool climate, frequently damp, with some foggy weather, but on the whole very pleasant, and many people come here in the summer, to escape the heat of the interior valleys, and in the winter from the East, to escape the intense cold.

During the rainy season the winds blow from the north and south-east. The number of rainy days average about 7 in November, 12 in December, 10 in January, 9 in February, 9 in March, and 5 in April. Winter is the most agreeable season of the year. During the dry season the trade winds prevail. In the months of June, July, and August heavy fogs come in from the ocean early in the evening and continue until 9 or 10 o'clock in the morning. Tender plants, many of tropical origin, thrive in the open air the year round, and flowering plants and shrubs grow with wonderful luxuriance.

From a horticultural point of view, San Francisco's importance is as a consumer and shipper of fruits. None are grown here, but the city is a vast entrepot for a large portion of the fruit product of the State. Here a large part of it is repacked and shipped green to various parts—to British Columbia, Alaska, Australia, China, Japan, the Islands, Mexico, South America, and points in our own State where some varieties are not grown. Here, too, a large amount finds its way to the canneries and to packing houses, and is shipped out as canned or boxed goods, while much dried fruit finds its way into the hands of jobbers, by whom it is reshipped to Eastern houses.

The importations of green fruit into San Francisco from all sources in 1891 was: deciduous, 6,687,000 pounds; citrus, 160,000 pounds; of this 4,052,000 pounds of deciduous fruit and 92,000 pounds of citrus

fruits were consumed, the remainder being reshipped to other points. There was shipped by rail from San Francisco last year:

	Pounds.
Deciduous fruits.....	118,000
Citrus fruits.....	68,000
Dried fruits.....	6,478,000
Canned fruits.....	19,278,000
Raisins.....	1,050,000
Nuts.....	4,000
	26,996,000

In addition to this there was shipped by sea during the same period:

	Pounds.
Deciduous fruits.....	2,417,840
Dried fruits.....	747,914
Canned fruits.....	15,223,440
Raisins.....	603,520
Nuts.....	94,500
Olive oil (California product).....	12,088
	19,099,302

Recapitulation.

	Pounds.
Shipments by rail.....	26,996,000
Shipments by sea.....	19,099,302
Total.....	46,095,302

Add to this the quantity of fruit consumed in various forms in San Francisco, by far the larger part of which is of California production, and the importance of San Francisco to the grower will be appreciated.

As showing the wide range of export possessed by California fruit, the following table, showing points to which shipments by sea were made in 1891, is presented:

Where Shipped.	Canned Fruit.			Green Fruit.		Dried Fruit.		Raisins.	Nuts.		Olive Oil.	
	Cases.	Value.	Packages.	Value.	Pounds.	Value.	Pkgs.	Value.	Sacks.	Value.	Cases.	Value.
Amsterdam.....	86	\$331	20	\$18	700	\$86	8	\$35	4	\$22	1	\$10
Asiatic Russia.....	315	1,414	100	150	6,977	712	4	49	1	5		
Australia.....	18,130	67,045	10,056	19,427	292,687	22,408	1,764	7,614	77	476		
Batavia.....	1,131	4,816										
Bombay.....	566	2,626	1	4	109,091	11,638	1,245	3,378	253	1,793	113	625
British Columbia.....	2,323	10,120	1,882	3,252								
Corea.....	21	110										
Calcutta.....	426	1,942										
Central America.....	711	2,602	1,350	2,432	13,308	1,059	943	6,175	148	1,578	86	465
Chile.....	1,471	6,912	503	8,821	9,113	1,131	224	1,091	76	444		
England.....	172,073	754,200	125	563	10,590	1,036	55					
France.....	8	48										
Germany.....	2,451	8,926	8,745	1,495	46,705	4,868	1,194	4,640	364	2,749	193	961
Hawaiian Islands.....			20	50							19	213
Ireland.....	1,391	5,477										
Japan.....	2,005	10,206	1,149	2,220	6,230	633	212	519	13	150	5	14
Kirkee.....	13	50										
Cotta Rodia.....	45	165										
Marshall Islands.....	92	311	10	15	306	31		6				
Mexico.....	351	680	5,991	9,610	30,299	2,973	1,277	5,719	106	1,796	17	106
New York.....	11	61	6	27	191,275	24,803	2	3	1	8	78	1,508
Marquesas.....	42,045	188,634										
Padang.....	283	1,055										
Pekalogan.....	56	155										
New Zealand.....	3,449	13,640	100	199	29,934	2,393	589	5,283	2	31		
Penang.....	584	2,408										
Peru.....												
Karantonga (Harvey Islands).....	3	4			50	7	1	26				
Rotterdam.....	220	775										
Scotland.....	2,290	9,816										
Surabaya.....	1,046	4,113										
Tahiti.....	78	274	78	188	449	128						
Tonga Islands.....	25	100	37	178								
United States of Colombia.....	20	82										
Tasmania.....												
Vernan.....	6	24										
Totals.....	253,725	\$1,099,122	30,123	\$48,649	747,914	\$73,961	7,544	\$34,955	1,045	\$9,052	512	\$3,901

Summary, in Pounds.

	Pounds.
Canned fruit	15,223,440
Total pounds	19,099,302
Total carloads	954
Total value	\$1,269,640
Green fruit	2,417,840
Dried fruit	747,914
Raisins	603,520
Nuts	94,500
Olive oil (California product)	12,088

There are at the present time 43 establishments in San Francisco engaged in the wholesale handling of fruit, and over 300 people engaged in the retail trade. There are 16 packing and canning companies who are engaged in either the exclusive packing of fruit, or from whom it receives the larger share of attention.

SAN JOAQUIN COUNTY.

San Joaquin County lies at the head of the San Joaquin Valley, and is bounded by Stanislaus, Calaveras, and Amador Counties on the east, Stanislaus and Santa Clara Counties on the south, Alameda, Contra Costa, and Solano Counties on the west, and Sacramento County on the north. The two great rivers which drain the State, the Sacramento from north to south, and the San Joaquin from south to north, form their junction near the northwest corner of this county, and pour their united waters into Suisun Bay. The San Joaquin River intersects the county, and is navigable to its southern boundary the year round. The area of this county is 1,370 square miles, or 870,000 acres, generally level valley land. In the northwest, along the rivers, is a region of tule land and marshes; through the northern part of these tule lands the San Joaquin and its tributaries flow in many channels to their junction with the Sacramento. Throughout this region are numerous islands, which are subject to overflow. They have rich soil, and such as are leveed are under cultivation. Extending northward are the sandy lands, the two sections being separated by a broad belt of black loam and adobe land. The foothill region comprises a narrow strip along the eastern boundary. The lands forming the delta comprise about one fifth of the land of the county. These had to be protected from overflow by the construction of levees before they could be brought under cultivation. About 150,000 acres are in cultivation.

The Mokelumne River, an important tributary of the San Joaquin, flows through the northern part of the county, and is navigable for a considerable distance from its intersection with the San Joaquin. The Calaveras River, a stream carrying much water in the rainy season, flows through the central portion of the county.

What has been said of the climate of other counties in the San Joaquin Valley, will apply to San Joaquin County. The months of June, July, August, and September are hot, especially July and August, when the mercury will frequently pass above the hundred mark. But despite this degree of heat, it is not enervating, and except on extremely hot days, which are rare, the summer temperature is not disagreeably hot. In the winter months the mercury will sometimes drop below freezing, and harsh frosts in the early morning are not uncommon. The location of the county in the central portion of the State, and so near the only great pass through the Coast Range, by which the waters of the two

great rivers of the State find their outlet to the ocean, renders the locality subject to the most favorable natural climatic influences. Heavy fogs are rare, and the chilling winds which sometimes prevail on the coast are much modified before they reach the interior.

The following table of rainfall from 1870-71 to 1886-87, will give a good idea of the annual precipitation in San Joaquin. In July and August rainfall is so rare that it may be said never to rain in those months:

Season.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April.	May.	June.	Total.
1870-71				.15	.67	1.35	1.47	1.70	.30	.78	.45		6.87
1871-72				.14	1.09	11.49	2.58	3.46	1.43	.51	.06	.04	20.80
1872-73				.03	1.37	6.25	.75	3.97	.47	.43			13.27
1873-74				.31	.76	3.94	3.94	1.78	3.33				14.06
1874-75			.23	1.09	3.45	.23	4.54	.28	.87			.45	11.14
1875-76				.01	5.86	2.85	3.26	2.65	3.23	.40			18.26
1876-77				.21	.30		3.32	.23	.75		.21		6.99
1877-78	.07			.36	.72	1.31	5.45	6.70	2.56	1.01	.65		18.76
1878-79				.34	.51	.42	2.28	2.94	2.06	1.75	.96	.20	11.46
1879-80				.58	2.05	1.67	1.54	1.32	.89	6.28	1.10		15.43
1880-81					.45	7.09	2.83	2.50	.82	1.11		.29	15.09
1881-82			.03	.24	.73	1.65	1.27	.84	3.64	2.21		.11	10.72
1882-83			.50	1.86	1.11	.27	2.55	.35	2.55	1.23	4.84		15.26
1883-84			.18	.93	.51	1.00	1.94	4.43	6.66	2.94	.50	1.27	20.36
1884-85		.03	.19	1.40		6.08	1.24	5.36	.04	1.21	3.43		9.62
1885-86													17.36
1886-87				.22	.84	.82	.36	3.78					

Although there is a great variety of soil, it may be confidently asserted that there is no utterly barren or unproductive lands in the whole of San Joaquin County. Even in the limited mountainous district in the southwestern portion, which is so rugged and hilly as to be incapable of profitable cultivation, the land affords a fine range for stock in seasons when the usual rainfall causes the native grasses to grow in abundance upon the steep hillsides.

The western portion of the county consists of a rich delta, bordering the San Joaquin and the Mokelumne Rivers, which here have channels dividing the lands into tracts, which are designated as islands. The natural growth upon this land is a species of flag, here termed tule, which rankly grows upon the overflowed ground, and appears to the traveler upon the steamers plying upon these rivers, in some seasons of the year, like immense fields of green grain. As this kind of vegetation would indicate, the land was formerly constantly subjected to overflow, and only in the later months of the drier seasons was it free from water so that stock could range upon it. It has, however, been demonstrated that this land is among the most productive and valuable in the State, and that by the expenditure of comparatively small amounts for the construction of levees to protect it from overflows, it can be made to produce a great variety of crops. Although the reclamation of these lands was at first regarded as problematical, and many mistakes and failures marked the progress of the work during its earlier inception, enough has now been accomplished to show that the work upon a large scale is wholly practicable, and the success that has attended the efforts of those who have given the subject proper attention when constructing their reclamation works, so as to effectually secure the object sought, will encourage the owners of most of this character of land to provide for bringing it under cultivation.

In some of the reclaimed districts there are orchards of peaches and pears, which are very productive, and the small fruits, such as blackberries and strawberries, are also grown there with great profit.

In the central portion of the county and surrounding Stockton there is a large area of adobe land, a black, clayey soil, from 4 to 8 feet in depth, resting upon a subsoil of marl or a clayey hardpan. While this soil is intractable and not easily worked except when in a suitable condition, or when it contains exactly the proper amount of moisture, it is remarkably fertile. This soil with irrigation and careful cultivation will produce a great variety of crops, and has been found especially adapted to the growth of choice varieties of table grapes, as well as the pear and other varieties of fruit trees. Through the portion of the county where the adobe land predominates there are, however, many varieties of soil, all of which have been proven to be equally good for the production of the cereals, but some better than the adobe for other crops. While all varieties appear to be rich in plant-food, some are more easily worked and contain different portions of sand and alluvium matter, which makes them more suitable for growth of trees and vines.

That portion of the county lying north of the Mokelumne River was originally covered with a growth of white and live oak trees, together with chaparral and other underbrush. It was not regarded with favor by the first settlers, and was not cleared and brought under cultivation for several years after farming had been carried on to a large extent in other portions of the county. It is now, however, regarded as among the most valuable land in the State.

Along the Mokelumne there is considerable bottom land, which is overflowed in seasons of extreme high water, but which can be cultivated after the water recedes. This land is extraordinarily fertile and capable of producing an almost endless variety of crops. Along the lower Mokelumne is a large extent of territory which was classed as swamp land. Much of this has been thoroughly reclaimed, and is now profitably cultivated to cereals and other crops. Staten Island contains about 3,000 acres, and a portion of this delta formed by the two channels of the Mokelumne has been reclaimed at a great expense, and is now made very productive.

South of the Mokelumne, and extending from the swamp land to the foothills on the east, is a large area of very valuable land, the soil of which is a sandy loam, easily cultivated and well adapted to the growth of vines and fruit trees. The grape can be here successfully grown without irrigation. In the eastern portion of the county, extending from the Mokelumne River south for about 12 miles, there is considerable hilly and rolling land, the soil of which is varied, but generally a red clay, and sometimes containing gravel. At present most of this land is cultivated to wheat, but it is believed by many to be choice vineyard land, as the grapevine has been profitably grown in many places.

The land bordering the Calaveras River has generally been considered among the best in the county. Its rich, alluvial soil has always produced large crops of wheat, and those who have planted trees and vines in this portion of the county have generally been successful in growing them without irrigation.

In the southeastern portions of the county there is a large area of land with sandy soil, which was originally not considered as valuable as those portions of the county where heavier, clayey soils predominate.

It is a noticeable fact, however, that the farmers upon the sandy soil of the county are generally prosperous, and although their land may not produce so much per acre, they generally feel sure of a crop.

Upon the west side of the San Joaquin River in this county there is a body of land from 8 to 10 miles in width and extending for 25 miles, which in favorable seasons has produced extraordinary crops of wheat. The soil is a deep, sandy loam, in many places from 30 to 40 feet to the hardpan, and with a supply of water it could be made the most productive and valuable land in the county. This large body of land is an important portion of San Joaquin County, and must eventually be furnished with means of artificial irrigation from the San Joaquin River, which in seasons when irrigation is necessary to secure the growth of vegetation pours its torrents of water past the land to the sea.

The Mokelumne in the northern, the Calaveras in the central, and the Stanislaus forming part of the southern boundary of the county, are all important streams, and can be used for irrigation; but irrigation is not generally practiced, as upon much of the land crops can be produced without recourse to it. Two irrigation districts have been formed, and one, known as the Mokelumne Ditch and Irrigating Company, is in operation irrigating land near Lodi. This company was organized in 1876, with a capital stock of \$100,000, for the purpose of taking water from the Mokelumne River for irrigation, manufacturing, and mining purposes. The capital stock has since been increased to \$300,000. The company has built a dam 32 feet high and 277 feet long, and the line of the main canal has been surveyed from the dam to Bear Creek, a natural channel, which will be used in its distributing system. The main canal is 30 feet wide on the bottom, 42 feet at water-surface, and will carry 6 feet of water. The grade of the canal is sufficient to give it a capacity of 598 cubic feet per second. The amount of land lying under the company's main canal adapted to irrigation purposes is about 120,000 acres. It is the intention of the company to furnish water for manufacturing purposes.

Irrigation has at last received the attention of the citizens of San Joaquin County. A company with a capital stock of \$500,000 has secured the rights on the Stanislaus River, and the work is progressing rapidly. By this ditch the southern and eastern portions of the county will be irrigated.

The Mokelumne Land and Water Company has already expended \$50,000 on a stone dam which is being built across the Mokelumne River. This will turn a stream of water through a ditch 20 feet wide on the bottom and 50 feet on the top, over the northern and central portions of the county.

The Weller Ditch Company will furnish the central portion with a never-failing supply of water.

Within a very short time San Joaquin will have the best irrigating system in the United States.

Experiments have been made to test the capabilities of the soil and climate of San Joaquin County for the production of a large variety of fruits, and while it has been demonstrated that in locations where the conditions are favorable almost every kind of fruit tree produced in the temperate and semi-tropical regions can be successfully grown, it must be admitted that particular care should be given to the selection of

varieties that are adapted to the different localities. The pear, fig, and almond tree will flourish with proper cultivation in almost all portions of the county, and in many localities without artificial irrigation. The pear tree, if given proper attention, has been proved to be very productive, and orchards have yielded a large profit to their fortunate owners. Even upon the heavier and more intractable soils it does well, and seems to be but slightly affected by the summer drought after the tree is well rooted, as it seems to draw sufficient moisture from the subsoil to secure for itself a healthy growth, and also to enable it to produce a crop of fruit. In the vicinity of Stockton, and upon land that is not regarded as the best for the growth of trees, there are trees that have regularly produced fine crops of pears, which have not been artificially irrigated for many years.

The fig tree also seems to be especially adapted to this soil and climate, and is as tenacious of life as the oak trees, which were growing upon this land when it was settled upon by Americans. The black California fig was very generally planted by the early settlers, and there are now many trees scattered throughout the State which have neither been cultivated nor irrigated for years, and yet they annually produce crops of figs, and seem to be little if any affected by the dry seasons which are so destructive to many other kinds of trees. It has also been found that other varieties of figs, which are so highly prized in other countries, and from which the fig of commerce is produced, can be successfully grown in this county, and that the imported varieties are as hardy and as well adapted to this climate as are those varieties which have been so long cultivated as to be almost natives of this State, and, like them, produce two crops each season.

The almond is another tree which has been found peculiarly well adapted to the locality, and can be profitably grown throughout the larger portion of the county. Trees which have arrived at the age when a full crop can be expected are now proving profitable to their owners, and almond orchards will eventually be among the productive industries of the county.

Walnut trees, including the black, English, and French, also do well upon most of the land in this county, and although on account of their slow growth they have not been generally cultivated, they are now beginning to be looked upon with great favor, and many are being planted each year.

The peach, apricot, and nectarine are grown successfully throughout the county, but most profitably upon the bottom lands and soils that are naturally moist.

The prune has been found to do well here, and more trees of that variety are being annually planted. The quince also flourishes, and is very productive in all portions of the county.

The small fruits, such as blackberries, raspberries, strawberries, etc., are grown throughout the county, and are particularly productive upon the reclaimed lands and the bottom lands adjacent to the rivers. These fruits can be raised throughout the county upon any land that can be irrigated, and large quantities are produced to supply the home market, and also for shipment to San Francisco.

The larger part of San Joaquin County is adapted to fruit culture, but the principal sections now devoted to orchards are found along the Mokelumne and San Joaquin Rivers, at Lodi, Stockton, and the numerous islands formed by the San Joaquin. This county is adapted to a

very wide range of fruits, chief among which are apricots, peaches, prunes, almonds, with some apples, pears, plums, olives, and figs. A very large quantity of berries of all kinds is grown in the island district. These fruits are principally shipped East to Chicago, although a large amount of the second-class fruit finds its way to the canneries of San Francisco and Sacramento. Besides the fruit shipped green, a large amount is annually dried, which is disposed of to San Francisco and Eastern jobbers. In packing for the Eastern market, peaches are packed in 20-pound boxes, pears in 40-pound boxes, and prunes in boxes and crates. The regulation packages are, peach boxes, 24 by 12 by 4½ inches, holding two tiers and weighing 20 pounds. These cost 5 cents each to the grower. Pear boxes are of the same dimensions, but are 9 inches deep, and cost 9 cents.

The shipment of fruit from Stockton in 1891 was 650 tons, but as the orchards of San Joaquin County were generally young, and as a large portion of them are not yet in bearing, this quantity will be very largely increased year by year.

There has been a great deal of planting done in many sections of the county during the last spring, principally apricots, almonds, olives, pears, and peaches.

The report of the present season's crop from San Joaquin is better than from most parts of the State: peaches and apricots, fair; almonds, good; grapes, extra good at Stockton; on the Calaveras and on the Mokelumne, not over two thirds of a crop.

Among the large orchards which have been planted in San Joaquin County within the last few years, are those of S. D. Woods, at Stockton, 120 acres; Armstrong & Cole, Lodi, 640 acres; Strong & Williamson, Acampo, 320 acres; Buck & Corey, Acampo, 400 acres; B. F. Langford, Lodi, 140 acres; E. Lawrence, Lodi, 30 acres; L. Mowrey, Lodi, 320 acres; Dr. E. T. Grant, 100 acres; E. L. Wilhoit, Acampo, 30 acres; M. Van Guelder, Acampo, 320 acres; T. H. Williams, Undine, 200 acres; Mr. Gregory, Linden, 100 acres; J. D. Corey, Linden, 80 acres; W. H. Hickey, Linden, 80 acres; W. C. Gillingham, Lockeford, 80 acres; Jos. Buttman, Clements, 80 acres; H. H. Moore, Stockton, 80 acres.

ACREAGE AND VARIETY OF FRUITS IN SAN JOAQUIN COUNTY.

Variety.	Acres in Trees.			
	Bearing.	Non-Bearing.	Total.	Plant of 1892.
Apple	35	40	75	20
Apricot	323	370	693	94
Cherry	46	65	111	30
Fig	42	113	155	50
Olive	1	83	84	12
Peach	324	506	830	231
Prune	366	145	511	57
Pear	124	256	380	61
Lemon		1	1	
Orange	1	37	38	8
Nuts—Almond	97	755	852	25
Walnut	27	42	69	3
Raisins	618		618	
Table grapes	1,043		1,043	
Small fruits	520		520	
Totals	3,567	2,413	5,980	591

SAN LUIS OBISPO COUNTY.

San Luis Obispo County is bounded along its entire western side by the Pacific Ocean, on the north it is bounded by Monterey, on the east by Kern, and on the south by Santa Barbara County. Its area embraces 3,578 square miles, or 2,214,000 acres, and extends from the summit of the Coast Range on the east to the ocean on the west.

The county is traversed by a low range of mountains running northwest to southeast, dividing the county into two unequal parts, one third being on the coast and two thirds being in the interior. The elevation and trend of this range adapt it to catch all the rains of the winter, giving it and the subjacent country an abundance of water. Springs are numerous from base to summit, and many streams run perennially through deep valleys down either slope. The largest of these streams on the western slope are the San Simeon, Santa Rosa, Villa, Old Creek, Mono, Chorro, San Luis, Pismo, Arroyo Grande, Suez, Huasna, Alamo, and Cuyama.

From the northeastern slope of this range flows the Salinas with its many branches, the San Juan from the far east, Santa Margarita, Atascadero, Paso Robles, San Marcos, Nancimiento, the latter receiving the Los Tablas, flowing northerly between the Santa Lucia and the range called the San José by the United States Geological Survey.

The valleys of San Luis Obispo County are many and fertile. West of Santa Lucia is the coast region, a broad area of foothills and valley land, with the specially named valleys of San Simeon, Santa Rosa, Green, Villa, Old Creek, Morro, Chorro, Los Osos, Laguna, San Luis, Corral de Piedra, Arroyo Grande, Huasna, and Cuyama, and east of the dividing mountains are the great valleys of San José, or Pozo, Santa Margarita, Salinas, Huer Huero, San Juan, Carrisa, Elkhorn, Estrella, Pala Prieta, Cholama, and those of many streams. The Estrella is one of the large valleys of the east, an elevated plain bordering the Estrella River, and north of it is the similar plain of Cholame.

In climate San Luis Obispo County differs little from her neighbor on the south, Santa Barbara. On the immediate coast the heat of the summer is very much modified by the ocean breeze, and in the winter months warmth from the same source prevents extremes of cold, and hence the climate is equable the year round. In the interior valleys the heat is more intense in summer, and occasional frosty mornings occur in winter. Speaking of the thermal belt in San Luis Obispo County, Myron Angel writes:

"This is a pleasant term for that ill-defined region which is supposed to border every valley and to extend at a certain elevation along the coast of Southern California. Almost every section of California has its 'thermal belt,' each differing from the other according to the locality and the latitude, for it is certain there are climatic changes with the latitude, though slight. Thus, the foothills of the Sierra Nevada, and the slightly elevated regions of Vacaville, and Madison, and Winters in the Coast Range, are in the thermal belt surrounding the Sacramento Valley, and these are the favorite fruit sections of the north. But in those localities frosts are quite heavy in winter, which is favorable for deciduous fruits, but not sufficiently severe to be damaging to citrus fruits. In such comparison we might say that all the coast region of San Luis Obispo was in the thermal belt, but here it is not so estimated. The thermal belt is that region where frosts are unknown, where the

winds do not sweep too severely, where the air is unburdened by fogs, and the genial sun of summer fructifies and enriches the fruits of the earth. Along the coast throughout this county frost is rarely seen, in many places never, and still, near the ocean, grapes do not ripen, nor do citrus fruits grow successfully. There is here a distinctive thermal belt, such as we have mentioned, lying between the altitudes of 100 and 600 feet of elevation, where there is not a damp and level valley. All the little ridges of this region lift themselves above the frosts of night, and everywhere all delicate plants grow without danger. The distinctive belt is that lying east and north of the city of San Luis Obispo, skirting the base of the hills and extending along the mountain side. There frosts are unknown, and tomatoes and other delicate plants furnish their flowers and fruits, regardless of the month or the season. There are the oldest orange trees of the county growing from the seed, planted as an experiment, and coming into bearing when eight years old, producing an excellent fruit. With this proof of success others made the trial, and the most delicious oranges now known grow in this belt. Wherever it may be followed, north or south, to the elevation of 600 feet, this band of genial temperature will be found, the most certain in its products of any portion of our favored region."

The rainfall of San Luis Obispo averages a little over 21 inches, the rainy season commencing usually in October, in which month the first early rains may be looked for, and continuing until the following May. In October and May, however, but little rain falls, the season being included really in November and April. The heaviest rainfall of which any record was kept was in the season of 1883-84, when 42.40 inches were recorded; the lightest was in 1876-77, when but 8.15 inches fell.

The soil on the coast is rich and deep, alternating adobe and sandy loam, the former predominating. That of the eastern part is deep, rich, sandy loam, with slight traces of light adobe, and in both sections, from the low valleys to the tops of the highest hills, is of the best quality. In the foothills the red lands peculiar to their formation prevail. It is a sharp, gravelly soil, with a large admixture of adobe, and is easily worked and very productive.

San Luis Obispo does not take rank among the leading horticultural counties of the State. Yet from what has been done in this line there it is evident that she has great capabilities. Nearly the whole range of fruits do well there wherever they have had proper care. Fruits of the citrus variety are grown successfully in favored locations. There may be seen in full bearing all the fruits that are grown anywhere in the State, including oranges, lemons, olives, figs, apples, pears, peaches, prunes, apricots, nectarines, almonds, walnuts, wine and raisin grapes. In the Arroyo Grande section fruits and vegetables of all kinds are produced in profusion, and of a size and quality that are astounding even in this State of wonderful growths. On the coast side the apples and pears rank among the best, while in the interior the prune, apricot, and olive are the favorites. On the hills the choicest wine, raisin, and table varieties of grapes are produced. Near Templeton is one of the largest bearing prune orchards in the State, consisting of 250 acres. Considerable attention has been paid to the raisin business.

The fruit interests in the immediate vicinity of Paso Robles attract much attention, although the orchards are young. Prunes, olives, apricots, pears, and peaches take a front place in our State exhibitions.

Particular notice should be made that fruit trees bear at a younger age than in most sections, prunes at three and olives at four years bearing quite a crop.

East of the Santa Lucia Mountains a large section of the country is specially suited to fruit culture, notably around Creston, Templeton, Paso Robles, and, in fact, all of the Salinas Basin and the San José Valley.

In the valleys around the city of San Luis Obispo the fruit raiser reaps a rich reward for his labors, especially with nuts, oranges, lemons, figs, and olives, the latter being a very remunerative fruit, and growing luxuriantly. The southern portion of the county is well adapted to all fruits; especially must the valley of the Arroyo Grande be named, and it would be hard to say that one portion of the county is better than another for general fruit raising.

The chief fruit sections of San Luis Obispo County are Paso Robles, Cambria, Templeton, and the country adjacent to the town of San Luis Obispo. These sections are devoted chiefly to apples, peaches, pears, grapes, olives, prunes, and plums, all of which do well when proper attention is paid them.

While the Mission orchard of San Luis Obispo is one of the oldest in the State, having been planted by the Franciscan friars in the last century, San Luis Obispo has never figured as a fruit county, and it was not until the last few years that any extensive planting of orchards was done. Of late, however, considerable acres of land have been set to fruit in different parts of the county. As these orchards are all young the output of fruit there has not exceeded the local demand, and little, if any, has found its way to the outside market. The fruits grown there are generally very fine in quality, the olive doing especially well. The yield for the present season has been very light, owing to a late frost which injured the crop of San Luis Obispo in common with the rest of the State. Prune trees suffered severely, and the returns from these was almost a total failure. Peaches were very light, and other fruits fell below the usual average.

East of the San Lucas range is found the chief fruit section of the county, where there are some 5,000 acres in fruit of various kinds, of which between 300 and 400 acres were planted in the spring of 1891.

There have been a great many Swedish settlers who have located in the vicinity of Paso Robles and elsewhere in San Luis Obispo, most of whom have set out small orchards of from 5 to 10 acres each.

Among the more important plantings is that of the Upoma Land Company, who last spring set out 220 acres in the following fruits:

	No. Trees.		No. Trees.
Apricots	8,500	Apples	1,000
Prunes	10,000	Pears	200
Nuts	12,200	Peaches	1,000

It is the intention of this company, during the coming season, to add to this 5,000 peaches, 1,000 nuts, and 1,000 pears. The total acreage in fruits is 4,059, of which there were planted during the spring of 1891:

	Acres.		Acres.
Deciduous fruits	907	Walnuts	30
Raisins	12		
Oranges	5	Total	956
Almonds	2		

ACREAGE AND VARIETY OF FRUITS IN SAN LUIS OBISPO COUNTY.

Variety.	Acres in Trees.			
	Bearing.	Non-Bearing.	Total.	Plant of 1892.
Apple	219	151	370	54
Apricot	232	134	366	112
Cherry	91	21	112	21
Fig	24	10	34	10
Olive	84	44	128	44
Peach	306	203	509	82
Prune	828	316	1,144	100
Pear	141	214	355	95
Lemon	104	36	140	26
Orange	15	5	20	5
Nuts—Almond	23	16	39	10
Walnut	245	234	479	108
Table grapes	925		925	
Small fruits	25		25	
Totals	3,262	1,384	4,646	667

SAN MATEO COUNTY.

San Mateo County is bounded on the north by San Francisco, east by the bay and Santa Clara County, south by Santa Cruz County, and west by the Pacific Ocean. The county is 5 miles wide where it adjoins the City and County of San Francisco. To the southward it rapidly widens, and attains a width of 20 miles in the center of the county, and much over that distance at its southerly line. Its length is 42 miles on a straight center line. Its area is 459 square miles, or 303,500 acres. It has a frontage of 65 miles on the ocean and 35 miles on the bay of San Francisco. Its frontage on the bay is a gradual slope from the foothills of the Santa Morena range to tidewater. This slope skirts the bay shore, and is flanked by the Santa Morena range, which separates it from the Pacific Ocean.

San Mateo County covers the larger part of the peninsula which bounds the bay of San Francisco on the southwest, being separated from the Golden Gate only by the city of San Francisco. This peninsula, about 5 miles wide along the line of division, broadens rapidly towards the south to a width of 15 miles. The greatest length of San Mateo, from northwest to southeast, is 35 miles. Beyond the southern verge of the San Francisco hills the bay sweeps abruptly inland. Low headlands extend southerly in irregular indentations to the county line, where the bay curves gently inland, again forming a crescent at the foot of Visitacion Valley. South of this valley the hills rise abruptly to the summit of Mount San Bruno. The Coast Range, which runs through the west of the county, has at the southern line a width of fully 9 miles of broken and semi-detached ranges, and an average altitude of about 2,500 feet.

The topography of the county governs the climate. The Santa Cruz Mountains continue their course through San Mateo County. They trend to the northwest, and at a point 14 miles from the straits through which the waters of the Pacific Ocean flow into the bay of San Francisco, they rapidly fall in height, and seem to lose themselves in the ocean. From this point to the south side of the Golden Gate the face

of the ground is broken into low, rolling hills and sand dunes of variable heights. The northwest summer trade winds, accompanied by detached drifts of fog, sweep over the depression, and give San Francisco its harsh but not unhealthful summer climate.

South of the point of the peninsula the mountains rise rapidly, attaining a height of 2,500 feet above the level of the sea. This range turns the current of the sea breeze, and holds back the fog which crawls up the slope and banks itself along the summit, as though it had become entangled in the trees and shrubs which crown the crest of the range. This mountain fog bank is the condensed freshness of the sea, out of which a cool breeze flows down the easterly slope of the range to the bay shore, cooling the atmosphere without the inconvenience of the propelling winds or actual contact with the fog. In other words, the air warmed by the morning sun rises up and checks the fog, while a cool breeze flows down the slope to replace it.

The climate is, in fact, a successful blend of the sea breeze, having a normal temperature of 55°, with the warm air of the Santa Clara Valley, which meets it from the south. The combine affords every element of physical comfort, an average temperature of 72° in summer, and rarely, if ever, below 36° during the coldest winter nights, which occur usually between the 15th of December and the 15th of January.

Springs of excellent quality and quantity of water are numerous on the ocean side of the Santa Morena range. There are many streams which carry, or did until otherwise appropriated, a liberal volume of water to the sea. The most important are Pillarcitos, Lobetos, Tunitos, San Gregorio, Pomponia, Pescadero, Butano, Gazos, and New Year Creek. On the bay side the water is not so abundant.

The soil of San Mateo is generally a warm, sandy loam, with an admixture of adobe in some localities. There are about 23,000 acres of salt marsh land on the bay side.

San Mateo does not rank among the leading horticultural counties of the State. At Pescadero some excellent apples are grown, and fair peaches, prunes, and some other fruits. The great interests of San Mateo are dairying and vegetable growing for the San Francisco market. That fruit would do well, if attention were given it, is shown by the statement of a fruit grower near Redwood City, who has a farm of 22 acres of healthy trees in the foothills, from which he reports the following yield:

625 Bulgarian prune trees, 73,131 pounds, at 1¾ cents.....	\$129 83
395 Petite d'Agen prune trees, 31,509 pounds, at 2 cents.....	690 19
301 Silver prune trees, 28,082 pounds, at 2½ cents.....	702 65
847 apricot trees, 101,257 pounds, at 2 cents.....	2,025 14
99 Coe's Golden plum trees, 10,347 pounds, at 2 cents.....	506 94
2 acres Japanese plum trees, 8,663 pounds, at 2½ cents.....	216 67
Total.....	\$4,271 42

Within 3 miles of Redwood City there is a still more important experiment. Five years ago 100 acres of fruit were planted—60 in apricots and 40 in prunes. The apricots bore two years since. There were 100 trees to the acre, and the fruit the first season was sold for \$2 a tree, gathering at purchaser's cost. Olive trees have, at the age of three years, produced quite a crop of fruit.

The chief fruit sections of San Mateo are Woodside, Menlo Park, Redwood City, San Mateo, and Belmont. These are adapted to the

growth of all kinds of deciduous fruits. Grapes are grown in large quantities around Searsville and Woodside. Apples, pears, plums, cherries, quinces, and berries do especially well. San Mateo finds its market in San Francisco, which it adjoins on the south, and its fruits are usually shipped in the green state. There were exported last season:

	Boxes.
Apples.....	300
Pears.....	140
Plums.....	200
Cherries.....	300
Total.....	940

The orchards in this county are generally small, being planted for family use, and ranging usually from one half to two acres in extent. But little new planting has been done.

ACREAGE AND VARIETY OF FRUITS IN SAN MATEO COUNTY.

Variety.	Acres in Trees.			
	Bearing.	Non-Bearing.	Total.	Plant of 1892.
Apple.....	140	9	149	3
Apricot.....	45		45	12
Cherry.....	5		5	
Fig.....	1		1	
Olive.....		28	28	12
Peach.....	12		12	
Prune.....	16	32	48	9
Pear.....	26		26	
Nuts—Almond.....	5		5	2
Walnut.....	1	2	3	1
Raisins.....	10		10	
Table grapes.....	100		100	
Totals.....	361	71	432	39

SANTA BARBARA COUNTY.

Santa Barbara County lies between San Luis Obispo and Ventura Counties. It is bounded on the west by the Pacific Ocean, and on the south by the Santa Barbara Channel, with its outlying islands. Below Point Concepcion the coast-line bends sharply to the eastward, and parallel with the line the Santa Ynez Mountains, for 3,000 to 4,000 feet in height, traverse the county from east to west. Beyond this range, running in a northwesterly direction, lie the San Rafael Mountains. The area of the county is 2,265 square miles, or 1,450,000 acres. A large portion of the northeastern portion of the county is a rugged mountainous region, largely worthless for horticultural pursuits, yet there are small valleys running up into these mountains which are pleasant and fertile. The Santa Ynez Mountains divide the county into two portions, the northern and southern, the former being much the larger and comprising four important valleys: Santa Maria, Lompoc, Los Alamos, Santa Ynez. The latter, that portion between the mountains and the ocean, is known as the Santa Barbara Valley, and comprises the smaller valleys of Carpinteria, Montecito, Goleta, and Elwood.

Traversed by mountains, there must, of course, be waste land, but there is the following acreage available for practical uses:

	Acres.
The Santa Maria Valley, with the valleys that open out of it and that pertain to it, and the slopes of the foothills that bound it.....	250,000
The Los Alamos Valley.....	150,000
The Lompoc Valley.....	230,000
The Santa Ynez Valley.....	200,000
The Santa Barbara Valley.....	108,000
Two islands.....	150,000
Total.....	1,088,000

The Santa Barbara Valley lies between the Santa Ynez Mountains and the sea, and has a world-wide celebrity for the fertility of its soil and the healthfulness of its climate. Between the Santa Ynez and the San Rafael ranges is the valley of Santa Ynez, widening into a broad extent of agricultural land and watered by the Santa Ynez River, which empties into the Pacific Ocean. The Santa Maria River on the northern limits of the county also drains a rich extent of farming lands.

The Santa Ynez Valley comprises about 120,000 acres of excellent arable land, mostly rolling. The Santa Ynez River runs the whole length of the valley, which is also watered by numerous creeks. The climate differs from that of Santa Barbara, being warmer in summer and cooler in winter, but the heat is dry and not oppressive, cool nights being the rule, while the winter is clear and bracing.

The Los Alamos Valley comprises about 40,000 acres of the richest of agricultural land, and as much more in the hills tributary to it of excellent grazing land. The valley is situated between two ranges of hills or low mountains, that separate the Santa Maria and Santa Ynez Valleys, and about 25 miles back from the coast.

Santa Maria, the largest and northernmost valley of Santa Barbara County, lies along the river of the same name, on the boundary of San Luis Obispo County. This valley, including its upper extension, the Sisquoc, is 30 miles from the foothills to the sea; its width, including the adjacent mesa lands, is from 3 to 10 miles. Many tributary cañons break into it through the hills, mostly small, but containing rich, protected, and generally well-watered land, excellently adapted to all kinds of deciduous and citrus fruits. The main valley has perhaps as varied resources as any in the State, on account of its large extent and consequent differences in climate and soil. On the west it opens to the sea, and has a heavier soil and more fog. The soil of the middle valley is a sandy loam, whilst that of the Sisquoc and the tributary cañons is deeper and richer. The lower and northern valley, especially the Oso Flaco side, grows large crops of beans, potatoes, etc., whilst farther up wheat and barley are yet grown. The future of the valley lies in its adaptability to fruit culture, in the parts best adapted for the special kinds.

There are very few portions of the world which can show so remarkable a climatic record as Santa Barbara. In the twenty years from 1871 to 1891, the temperature but once reached so low a point as 31°, and once as high as 102°. The average at Santa Barbara for thirteen years varied from 55° to 71°, a range of but 16° in all that period. Other records show a total of 310 pleasant days in a single year, 29 cloudy days, 12 showery days, 10 windy, and 5 rainy. In all there were but 29 days in the entire year during which an invalid could not be out of

doors with safety and comfort during the whole or a portion of the time. The temperature of the water of the ocean at Santa Barbara shows a variation of but 6° between summer and winter. It is no uncommon sight to see persons enjoying a surf bath in midwinter on the beach at Santa Barbara.

The following synopsis of the weather for the year 1891 is compiled from daily observations of temperature as shown by self-registering thermometer in the observatory of Hugh D. Vail, and the movement of the wind as measured by a Robinson anemometer:

	Mean Temper- ture.....	Mean Temper- ature of Warm- est Day.....	Mean Temper- ature of Coldest Day.....	Rainfall-Inches.	Wind—Miles.....	Relative Hu- midity.....	Clear Days.....	Fair Days.....	Cloudy Days.....
January.....	54.4°	61.5°	47.5°	.45	3.4	59	28	3	0
February.....	52.6	59.2	47.5	7.92	4.5	74	15	5	8
March.....	56.6	64.5	50.0	1.56	4.6	71	22	4	5
April.....	56.3	62.8	51.2	1.75	4.1	75	22	3	5
May.....	59.0	63.0	55.7	.30	3.8	76	10	4	17
June.....	62.5	70.5	56.2	.00	4.3	72	24	5	1
July.....	67.0	78.2	61.5	.00	3.8	78	21	6	4
August.....	69.1	76.5	63.0	.00	3.5	75	26	3	2
September.....	69.3	77.5	63.0	.15	3.5	69	23	4	3
October.....	63.0	72.5	58.2	.00	3.0	75	17	8	6
November.....	58.8	65.5	53.0	.00	2.6	70	22	5	3
December.....	51.9	61.5	43.5	2.43	4.7	61	24	4	3

The mean temperature of the year was 60°, differing by less than one tenth of a degree from the normal.

The highest temperature during the year was 96°, and the lowest 33°. There were 36 days when the temperature rose above 80°, and 35 nights when it did not fall below 60°.

Of the 365 days in the year, 254 were clear, 54 fair, and 57 cloudy.

Rain fell on 20 days, with a rainfall of 15.44 inches, being 2.70 inches below the average. Between the 18th of April and the 4th of December, a period of 230 days, the rainfall was less than half an inch.

The mean velocity of the wind for the year was 3.8 miles per hour; the greatest for any one month, 4.7 miles, in December, and the least, 2.6 miles, in November. The greatest movement of the wind in any one day was 276 miles, on the 2d of December, being an average velocity for the twenty-four hours of 11½ miles an hour.

The arable soil is for the most part either alluvial or adobe. The alluvial soil, found usually in the lower levels, is very deep, rich, and fertile. It is this soil that produces the Lima beans, for which Santa Barbara County is celebrated, and affords fresh strawberries and vegetables every week in the year. This soil grows well all varieties of fruits found in the eastern New England States, besides prunes, figs, olives, peanuts, English walnuts, grapes, plums, lemons, limes, oranges, loquats, guavas, persimmons, cherimoyers, dates, bananas, and numerous other semi-tropical fruits.

The adobe soil is black and quite fertile. It is best adapted to barley, mustard, oats, wheat, or flax, and furnishes the richest of pasturage.

While Santa Barbara does not take a stand in the front rank of horticultural counties of the State, sufficient has been done to show that in

soil and climate she is adapted to the culture of a wide range of fruits. Rev. Mr. Jackson, speaking of the fruits of this county, says:

"One who has lived in a temperate zone may write down the names of all the fruits he ever saw, and then add to the list all those his memory can call out of the books he has read, and in this county he shall be reasonably sure of finding them. Could it be shown that the primitive Eden bore as many fruits pleasant to the taste, it would add a new pang to the thought of original sin."

Stripped of its poetical hyperbole, the statement of Mr. Jackson conveys a truth. Santa Barbara is fitted for a higher place in the fruit-growing counties than she has occupied. Apples unsurpassed for size and flavor are produced around Santa Barbara and Lompoc. The peach, pear, apricot, nectarine, quince, plum, and prune trees bear early and extensively.

More attention has been paid to olive culture in this county than in any other county in the State, it having received a strong impetus from the success which attended the orchard of Hon. Ellwood Cooper, near Santa Barbara. In the Santa Ynez Valley large tracts have been set to olives. The soil here is diversified, and comprises rich bottom lands and rolling hills of a gravelly and sandy loam. This latter soil has been found peculiarly adapted for olive culture, and the industry has already assumed the proportions of a specialty. There are now planted over 30,000 olive trees, and a mill for the manufacture of oil has just been completed. The pioneer orchard belongs to Mr. Ralph R. Selby, of Ballard. Adjoining this property lie the orchards of Messrs. Hayne Bros. & Gould, comprising 13,000 trees, and up the valley are situated the ranches of Messrs. A. S. and A. M. Boyd, comprising 4,000 and 5,000 trees, respectively. The raisin, wine, and prune industries have been successfully prosecuted by Mr. Louis Janin, who also has a fine apricot orchard, while Mr. Max. Dormer has a thrifty young peach and prune orchard of some 14,000 trees. There are numerous small orchards of from 5 to 20 acres scattered through the valley.

Horticulture has also made rapid strides in the Santa Maria Valley. One hundred thousand trees have been set out within the last few years, and hardly an appreciable area seems as yet under cultivation. Prunes, apricots, and walnuts are the main output so far, though other fruits, such as apples, pears, peaches, and grapes do well. Citrus fruits require irrigation. No general plan of irrigation has yet been introduced; however, where locally irrigated, the lemon and orange do well.

In the Lompoc Valley the apple and pear do well, while the peach, apricot, cherry, plum, prune, and quince do fairly well. Berries of all kinds are produced in abundance also.

At Montecito all the field and orchard crops grow to perfection. A lemon is produced here that, on account of its excellence, has a market of its own. In the nurseries and dooryards are found tropical, palm, and other trees that are grown nowhere else on our coast.

The fig thrives throughout the warmer portions of the county, bearing two crops in a season, and the trees are long-lived and subject to no insect pest or disease. The Japanese persimmon is now found quite plentifully at the fruit stands, and is beginning to find favor. Two varieties of the guava are grown here; the loquat is finding friends; pomegranates grow easily; the cherimoyer, or custard apple, is well perfected near Santa Barbara, and the white zapota is also found. Date

palms are in bearing, bananas are perfected in the sheltered coast valleys, and there are many other semi-tropical productions that will no doubt find here congenial conditions.

All kinds of nuts, too, grow wonderfully in Santa Barbara. It contains the largest English walnut orchard in the world. The acreage in almond trees is increasing; the Italian chestnut thrives in the deep soils; the Japan chestnut has been recently introduced; the black walnut of the East is fruiting in many places in and near Santa Barbara; the butternut and pecan both make a rapid growth; and the peanut takes kindly to the valley's sandy soils.

The principal sections devoted to fruit in Santa Barbara County are Carpenteria, Montecito, Elwood, Livas, Santa Maria, and Lompoc, and the favorite fruits are walnuts, almonds, olives, Japanese persimmons, and all kinds of deciduous fruits. These are usually marketed to San Francisco, Denver, Chicago, and St. Louis. Bartlett pears and citrus fruits are shipped green, other varieties being dried and sacked. There was a very large output of pears, apricots, and peaches last season; but the indications for the present year are for a very large shortage in the yield.

Dried apricots and peaches brought 7 cents a pound at Santa Barbara last year, while this year jobbers are offering 12 cents for the same quality, F. O. B.

The earliest walnuts planted in Santa Barbara County were those put out by Russell Heath, of Carpenteria. Hon. Ellwood Cooper introduced olives and almonds, and the Hollister orchard is the pioneer in citrus fruits.

Until the present year the principal markets were mostly local, but the Pacific Coast Railway has lowered rates for the purpose of carrying fruit to the Santa Maria cannery in San Luis Obispo County, which has added a great stimulus to the export trade. The greater part of the fruit is shipped in its green state, a small quantity being dried, but none canned.

The acreage in fruit in this county will foot up about 18,000 acres, of which 4,000 acres were planted during the past season. Of this there are about 3,000 acres in the Santa Ynez Valley and 1,000 acres in the vicinity of Ballard. Two thirds of this acreage has been planted within the past four years, and the trees are just coming into bearing.

Santa Barbara is one of the leading counties in olive growing, and a very large acreage in olive trees is planted here. This industry was introduced by the Hon. Ellwood Cooper, who has an orchard of over 100 acres, the larger part of which are in bearing. The output of olive oil from this orchard in 1891 was 34,000 bottles.

ACREAGE AND VARIETY OF FRUITS IN SANTA BARBARA COUNTY.

Variety.	Acres in Trees.			
	Bearing.	Non-Bearing.	Total.	Plant of 1892.
Apple.....	289	128	417	104
Apricot.....	762	159	921	111
Cherry.....	108	92	200	71
Fig.....	450	300	750	119
Olive.....	565	306	871	209
Peach.....	549	112	661	82
Nectarine.....	11	21	32	18
Prune.....	659	168	827	112
Pear.....	200	108	308	78
Quince.....	20	—	20	—
Lemon.....	476	300	1,276	309
Orange.....	224	116	340	92
Nuts—Almond.....	240	100	340	71
Walnut.....	1,117	786	1,903	172
Table grapes.....	573	—	573	—
Totals.....	6,243	3,196	9,439	1,548

SANTA CLARA COUNTY

Santa Clara County has an area of 1,750 square miles—1,120,000 acres. It is surrounded by Alameda County on the north, Stanislaus and Merced on the east, San Benito on the south, and San Mateo and Santa Cruz Counties on the west. The county is near the geographical center of California, and immediately south of San Francisco. Its eastern boundary is the summit of the Coast Range, and its western the crest of the Santa Cruz Mountains. It extends southward 52 miles and has an average width of 34 miles. Its principal valley is the Santa Clara, which is 34 miles broad at the north and has an average width of 15 miles. Encircling the level lands of the valley is a wide region of rolling hills, beyond which rise the mountains, culminating at the western side in Mount Bache, 3,780 feet, and on the east in Mount Hamilton, 4,250 feet. Of the total area of the county it is estimated that 800,000 acres are suitable for the cultivation of fruits and vines; of these something more than 250,000 acres are in the valley and 300,000 acres in the foothills.

Looking down the valley from some elevated point in the surrounding hills, the general contour presented is that of a level plain, while it is, in fact, a series of gentle undulations, with marked variations in the character of the soil. In what is now, or recently has been, the lower portion of this plain, the soil is a black, tenacious clay known as "adobe." While very fertile and productive, it requires much care as to the time and manner of cultivating it, and is well adapted to hay and grain. The higher lands of the valley are a light, loamy, and sometimes gravelly soil. This is easily cultivated, and is adapted to all kinds of cereals and most varieties of fruits.

The "warm belt" is a tract upon the slopes of the hills which environ the valley. It has an altitude of from 600 to 2,000 feet. It is generally, and in some localities wholly, free from frost. In this belt, to the east of Milpitas, potatoes, peas, tomatoes, strawberries, etc., are grown through the whole winter for the San Francisco market.

Upon the Los Gatos and Guadalupe Rivers, in the immediate vicinity of San José, are some hundreds of acres, formerly dense willow thickets, but now in the highest state of cultivation. These lands, which are known by the general name of "The Willows," are regarded as the most desirable in the valley, and abound with lovely homes surrounded by splendid orchards. The soil is a sedimentary deposit, easily cultivated, requiring but little irrigation, and producing every variety of fruit and vegetable common to California.

In the southern portion of the valley the soil is especially productive. Over a considerable portion the subterranean moisture maintains the growing pastures throughout the year, and some of the most successful dairies in the State are established there. The more elevated portions of this part of the valley are well adapted to fruit and vines.

The valley is drained by a number of streams, the principal ones being the Los Gatos, Guadalupe, and Coyote Rivers. In summer time these watercourses greatly diminish, and the smaller ones wholly disappear. Having their sources in the surrounding hills, and sinking as they approach the valley, they augment the subterranean resources which supply the artesian wells. These are found all over the valley. They are usually from 60 to 100 feet in depth, though some find a larger and more permanent supply at a much greater depth. In the country the water is raised by windmills into tanks, furnishing an ample supply for household and gardening purposes, while the cities and larger towns are provided with reservoirs and complete waterworks systems.

So wide is the divergency in the character of the soil in different localities, that agriculturists are reluctant to express an opinion as to comparative merits, each section having demonstrated its fitness for growing some of the almost endless varieties of fruits and vines, which are here cultivated at almost fabulous profits. While there is no better soil in the world for the production of wheat and barley, the area devoted to the cultivation of these cereals is yearly decreasing, owing to the much greater remuneration obtainable from the growing of fruits, grapes, berries, and vegetables.

Alvira district has rich black loams, so highly prized for small fruits and vegetables, and the San José and Santa Clara regions have lighter loams and sedimentary deposits, valued for stone fruits. The shallower gravelly loams of the hillsides are also very desirable. Along the streams the land is deep, well drained, and very rich in desirable elements. Red chemisal and chaparral land on the hillsides of Santa Clara Valley has recently been put in fruit. Although reddish brown when dry, and inclined to form hard lumps, its supply of potash, lime, and humus is such as to promise very well under good cultivation.

The higher lands are of light loam, and in some places gravelly. They are composed of a black, tenacious, and wonderfully fertile clay loam. Along the banks of the streams the soil is of great depth and richness, while on the borders of the bay are thousands of acres of salt marsh, which, when reclaimed, are found to be the most productive. There are many small farms: 1,368 tracts of 10 acres or less, and 1,448 tracts of from 15 to 40 acres.

The mountain ranges which surround the Santa Clara Valley very materially modify the climate, shutting off, to a great extent, the fogs which prevail on the immediate coast, and the hot winds from the San Joaquin Valley on the east. There is a so-called winter and summer,

but the roses bloom in gardens through both of these seasons with an equal beauty. It has a wet season and a dry season, the former a succession of showery days, alternating with days of fair weather and brilliant sunshine. The dry season is not so dry as to blight the foliage of such trees and shrubs as require moisture for their subsistence.

The tops of the surrounding mountains are whitened with snow every winter, but the winds come into the valley from the north, and not from the mountains, so that these snowy ridges do not chill the air. Since the advent of the white man into the valley, snow has fallen but twice, and then melted on the same day. The temperature varies from 50° in the wet season to 80° in the dry. On rare occasions the thermometer may show a little higher temperature during the warm months. The summer is as free from heat as the winter is from cold. The self-same breeze from the bay that cools the air in summer warms it in winter, drawing its own temperature from the unchanging ocean.

Along the slopes of the mountains on either side of the valley, at an elevation ranging from 600 to 2,000 feet, exists a region known as the thermal, or warm belt. When there is a heavy frost in the valley below during the night, there is no sign of frost on these elevated tracts of land. This anomalous distribution of heat is explained by the fact that during the day the lower strata of air in the valley becomes heated and gradually rises up en masse, its place being supplied by the cold air flowing in from the north, near the surface of the ground, that has been cooled by radiation during the long winter nights. Orange trees planted in these thermal belts, at an elevation of more than 2,000 feet, suffer little from the ravages of frost.

The rainy season lasts from October to April. In the latter part of September the signs of a coming change are apparent. The winds, which have hitherto come from the north, now become variable both as to direction and force, or perhaps wholly cease. The stillness of the night is broken by fitful gusts which, while wailing through the trees, are the precursors of the coming winter. In the first ten days of October about an inch of rain will fall, followed by weeks of the finest weather.

The effect of these first rains is magical. It washes the dust from the foliage, and the earth puts on the freshness of spring. While in the East the year is gently dying, here a new year is apparently springing into existence. If in this and the succeeding months there are further showers, the grass springs up on every hand, the hills change their subdued coloring for a lively green, and wild flowers appear in every sheltered nook. The flowers supposed to be coincident with spring bloom in the gardens, and the perfume of the violet scents the air. It is not till the end of November or the beginning of December that the rainy season is fully established. A coming storm is now heralded by a strong, steady wind, blowing for a day or two from the southeast, followed by several days of rain, and these succeeded by days and even weeks without a cloud. And so, for six months from the time of the first showers, occasional storms alternate with periods of fair weather. The amount of rain which falls during the winter varies with the locality, from 15 to 35 inches being a fair estimate throughout the valley. Taking an average of a series of years, it appears that of the 182 days which comprise the rainy season, on 43 days in each year more or less rain fell; 69 days were cloudy; the balance bright and

pleasant. Thunder storms are practically unknown, the low rumbling being only occasionally heard on the mountains many miles distant. Severe wind storms and cyclones, so common in some of the interior States, are wholly unknown here, and as before stated, snow has but twice fallen since the advent of the white man.

With the month of March the rains are practically over, though agriculturists expect and hope for showers in April. May has perhaps a few showers during the first ten days, which interfere with the harvesting of the first hay crop, and then the dry or summer season is in full swing. By July the surface moisture has been taken up and dissipated, and the growth dependent upon it ceases. The nutritious grasses have ripened, and self-cured and dried are the food of the cattle and sheep. The waving fields of golden grain await the reaper.

And such is the winter of Santa Clara Valley, so strangely unlike winter elsewhere, for here man has interposed. Here, by art and labor, he has reversed the processes of nature, and constrained the course of the seasons. In gardens bright with foliage and resplendent with flowers, there is spring with its freshness and beauty; while in orchards teeming with fruits, and vineyards purple with ripening grapes, summer and autumn vie with each other for supremacy. Those months that in the East preclude all farming operations, are here the season of the most activity, gathering crops and preparing the ground for new ones. With the rains of November plowing and seed-planting begin, and continue with but little delay until March. If the rains continue too late in the spring, the later sown fields generally produce cleaner crops and of superior quality, while without these later rains the earlier sown crops are the best.

For the fruit growers these seasons are even more advantageous than to the farmer. No humidity or moisture for months to nourish the weeds which in other localities overrun orchards to the detriment of the fruit trees. In sections where there are constant showers, the utmost endeavors of the orchardists could not effectually keep the weeds under. Here the weeds germinate during the rainy winter months, are plowed under at the first plowing, and the surface of the ground drying to a depth of three or four inches at the commencement of summer, and so remaining during the entire season, it is impossible for seeds to germinate or plants to live. Any one who has attempted to start seeds in summer knows how necessary, in fact how indispensable, moisture is for their growth, and can appreciate the effectiveness with which the climate coöperates with the fruit grower in preserving all the moisture in the soil for the trees and vines. Thousands of acres of orchards without a weed, and the only labor to produce this result, one turning over with the plow in the early summer, is a marvel to the visitor, and a climatic condition fully appreciated by the resident.

Santa Clara is preëminently the horticultural county of the State. Every variety of fruit grown in California is produced here, but the chief of all the horticultural pursuits of the county is prune growing. Of the prune crop of California Santa Clara County produces nearly nine tenths; more than one half of all the prune trees in America are growing in this county. Last year's output of prunes in Santa Clara was over 22,000,000 pounds, and as yet but a small part, not over one third, of the orchards are in full bearing.

With improved facilities for marketing, this latest industry has, within

the last ten years, assumed marvelous proportions. The largest fruit canneries in the world are operated at San José, the leading city.

Santa Clara Valley is not a citrus-fruit country, although oranges, lemons, and limes have been successfully raised, and from time to time creditable displays of these fruits have been made. She finds greater profits, quicker returns, and a much wider market for the deciduous fruits, and her prunes, peaches, pears, cherries, apricots, nectarines, figs, plums, apples, grapes, berries (fresh, canned, dried, and glazed), her olives and olive oil, almond and walnuts, wines and brandies, are famous the world over.

The following, from the pen of W. H. Wright, gives a very excellent review of the fruit industry of Santa Clara County:

"The fruit industry began with the planting of orchards at the Mission San José. What were the varieties of the fruits planted by the Fathers it is not now possible to ascertain in detail. Vancouver says that he saw, on his visit in 1792, peaches, apples, pears, apricots, figs, and vines, all of which, except the latter, promised to succeed well.

"This Mission orchard was the only source of fruit supply to the valley for many years, and for some time after the American occupation it held a prominent position. It was claimed as a part of the public domain when California was ceded to the United States, and was taken possession of by J. W. Redman. It proved a bonanza, the fruit selling for 50 cents per pound, while the yield was enormous. Some of the old trees are yet vigorous, although neglected for years, and a prey to all the pests that have been known to Santa Clara County orchards."

The scarcity of fruit and the consequent high prices gave a stimulus to horticulture. Apples imported into San Francisco sold at retail for \$1 apiece, and other fruits in proportion. People thought that at half these prices there would be more money in a bearing orchard than in the richest gold mine discovered. The idea struck many at the same time, and many orchards were planted, principally of apples and pears.

In 1852 three large orchards were planted by E. W. Case, William Daniels, and Joseph Aram. Some of these old trees are still flourishing. Among them is an apricot tree on the Hobson place, formerly a part of Captain Aram's orchard, which is now thirty-six years old, a vigorous bearer, and a living contradiction to the statement that fruit trees in California are short lived.

In the spring of 1852 Commodore Stockton imported a large number of trees from Massachusetts for the purpose of establishing a nursery. The trees consisted of apples, peaches, pears, plums, nectarines, and apricots. With this importation came also the first strawberries grown in the valley.

During 1856 a horticultural fair was held in San José, and from this the reputation of Santa Clara fruit spread, and people came hundreds of miles to see it. In 1856 nearly all these early orchards had commenced to bear, and the quality of the fruit, and the promise of extraordinary productions, gave these pioneer orchardists an idea of the resources of the climate and soil in this direction. Everything they had planted prospered beyond their most sanguine expectations, and they were rapidly approaching the conviction that nothing could fail in Santa Clara Valley.

Being in this frame of mind they were ready to experiment in any direction, and that year stands out prominent as the date of introduc-

tion of the prune to this county, and in fact to this coast. The fruit has become a standard, and will probably always remain a favorite with our orchardists.

In 1868 the fruit interests of Santa Clara County received a heavy blow. The planting had heretofore been principally of apples and pears, and that year the yield was so great that the market was more than glutted. The influence of this experience was long felt, but it had its good effect, for it resulted in the planting of other varieties of fruits, and the adaptability of the soil and climate to them was soon apparent. Large orchards of cherries, apricots, and plums were planted, and fields of berries set out, and the infinite variety now grown always gives assurance of a ready market.

Heretofore the canning and drying of fruit in the valley was unknown. The want of some method for preserving fruit so that it could be readily shipped was felt, and this need was supplied by Dr. James M. Dawson, who had heretofore been unidentified with the fruit interests. In 1871 he put up the first canned fruit for the market. The first season's pack consisted of 350 cases of fruits and tomatoes, and the experimental effort proved entirely satisfactory. The company of which this was the inception now has a plant worth \$100,000, and during the busy season gives employment to over 500 hands.

The industry of drying fruit started up almost simultaneously with that of canning. The majority of the large orchardists commenced drying their own fruit, and the prices obtained were so good, and the result of the experiment as a whole so remarkable, that the practice was continued. Companies were formed and plants were established for this purpose alone, until now a vast amount of capital and energy is invested in this industry.

According to the figures compiled from the last statement of County Assessor Spitzer, the land of this county is divided into the following holdings: Thirteen hundred and sixty-eight tracts of 10 acres or less; 1,448 tracts of from 10 to 40 acres; 252 tracts of from 40 to 60 acres; 588 tracts of from 60 to 100 acres; 563 tracts of from 100 to 160 acres; 307 tracts of from 160 to 240 acres; 209 tracts of from 240 to 320 acres; 169 tracts of from 320 to 400 acres, and 309 tracts in excess of 400 acres.

For 1889 the statistics were:

Number of acres sown for the crop of 1888: Wheat, 17,240; barley, 20,370; oats, 115; corn, 185; hay, 32,820.

Acres of grapevines planted: One-year old, 235; two-year old, 765; three-year old, 1,530; four-year old, 2,340; five-year old and upwards, 6,505; total, 11,375.

Small fruits: Strawberries, 410 acres; blackberries, 87 acres; raspberries, 35 acres.

Number of fruit trees planted: One-year old, 184,815; two-year old, 116,485; three-year old, 128,365; four-year old, 233,660; five-year old and upwards, 927,535; total, 1,590,830.

Number of nut-bearing trees, 15,920.

Number of ornamental trees, 2,370.

Assessed value of fruit trees: One-year old, \$34,965; two-year old, \$36,945; three-year old, \$51,345; four-year old, \$116,850; five-year old and upwards, \$927,535; total assessed valuation of trees, \$1,167,640.

Assessed valuation of grapevines: One-year old, \$2,350; two-year old,

\$11,475; three-year old, \$30,600; four-year old, \$58,500; five-year old, \$325,250; total assessed valuation, \$428,175.

The statistics of 1890 show that 15,950 acres were planted to wheat, 174 acres to oats, 18,550 acres to barley, 328 acres to corn, and 37,150 acres to hay.

The total number of fruit trees growing in 1890 was 1,807,434.

The total acreage planted to grapes was 11,560, of which 1,015 acres were in table grapes, 900 acres in raisin grapes, and 9,645 acres in wine grapes.

The acreage in berries in the same year was: Strawberries, 215 acres; blackberries, 47 acres, and raspberries, 25 acres.

The acreage sown to grain for the crop of 1891, is as follows: Wheat, 16,300; oats, 140; barley, 17,820; corn, 379; hay, 35,178; potatoes, 345; tomatoes, 520.

The following table gives the number of bearing and non-bearing fruit trees growing in the spring of 1891:

	Bearing.	Non-Bearing.
Apple.....	49,580	18,965
Apricot.....	216,265	14,202
Cherry.....	68,835	47,920
Fig.....	560	615
Olive.....	5,520	6,875
Peach.....	238,590	280,575
Pear.....	59,122	29,070
Prune.....	446,959	394,030
Orange.....	920	415
Walnut.....	715	655
Almond.....	9,200	8,420
Totals.....	1,096,266	927,742
Grand total.....		2,024,008

The acreage otherwise planted was: Grapes, non-bearing, 9,415; bearing, 2,205 acres; strawberries, 245 acres; blackberries, 61 acres; raspberries, 37 acres; gooseberries, 9 acres.

These figures speak for themselves, and by a close study of them one can gain some faint idea of the magnitude of the fruit interests of this county. By a careful comparison it will be noted that the area planted to grain is continually decreasing, while the fruit and vine acreage is increasing in proportion, showing, what is almost unnecessary to state, that vineyards and orchards are being constantly set out.

Progressive diminution is shown in the number of fruit trees set out from 1885 to 1888. In the former year, 233,660 trees were planted. In 1886 but 128,365 were set out, while in the following year the number dropped to 116,485, or less than half the planting of the season of 1885. The number, however, increased in 1888 to 184,815 trees, and in 1890 the immense number of 529,140 trees were planted—about double the amount of any previous year.

This fluctuation is due to the fact that up to 1887 evaporated fruit brought 50 per cent more in the Eastern market than sun-dried fruit, and the yield of the orchards of Santa Clara County in 1886 had been more than evaporators could handle. This led to a belief that the market had been overstocked, and, consequently, but little effort was made to increase the supply. In 1887, however, there was a very large

harvest, and the orchardists were compelled to resort to the sun-drying process, and to ship the products thus cured to the East. To the surprise of the dealers it was found that fruit dried in the sun of Santa Clara County was superior to that dried by machinery. The price of such fruit immediately rose, and a new stimulus was given to the cultivation of orchards.

The effect of this was shown in the planting of 1888, 1889, and 1890. The number of trees set out in these years was limited solely by the supply. Unfortunately, that supply was not what it should have been. The nurserymen, not anticipating the reaction which came as soon as the success of sun-dried fruit in the Eastern market was assured, had made no provision for the increased demand. The prices of young trees rose rapidly. In 1885 trees had been sold on an average of from \$10 to \$15 per 100. In 1888 they brought from \$35 to \$40 per 100. The orchardists purchased them, however, at any price. They not only exhausted the supply in the county, but brought large numbers of trees from other parts of the State and from Oregon, and even imported thousands from Europe. Had the trees been available the plantings of 1888 would have been 75 per cent greater than they were.

Splendid prices were secured in 1890, and this led to the large increase in orchard acreage. Taught by the experience of the past, and the control of the market now being assured to the fruit products of the county, the nurserymen are preparing fully for the coming season.

The prices of 1891 were not up to those of the preceding year, but the profits, nevertheless, were good, and the orchardists are making great preparations for big plantings. Many of them are providing their own young trees, and the supply for the future promises to fully equal the demand. As it takes two years for a young tree to grow into sufficient size for orchard planting, the effects of these preparations will not be fully felt this year, but in the coming season the number of trees set out will probably equal if not surpass the plantings of 1890. In but a few years the probability is that the acreage of orchard lands will extend over the entire Santa Clara Valley and far up on the mountain sides, and this valley will be one vast expanse of orchards loaded down with the golden fruits which have proved more profitable and brought in greater riches than the biggest bonanza discovered in the golden days of the mining excitement. It is a wealth, also, that is inexhaustible, and does not decrease. It is continually augmenting, and will augment for years and years to come. It is wealth of which every one may partake. He who owns a few acres of good fruit land in this county has an assured competency for life, and is one of the most independent men on God's footstool. He is indeed to be envied, for there is not in the world a freer man.

Parker Earl, President of the American Horticultural Society, in an address delivered during a meeting of the association in San José in 1888, said: "The business of fruit growing is one of the noblest occupations of the world if carried on with a faithful spirit. The results of our work contribute directly and powerfully to the betterment of mankind. We minister to the health and moral status of the community. I would have every horticulturist regard his vocation with becoming pride. We work with the great forces of nature. We form alliances with the sunshine and rain, and the secret affinities of the soil. We manipulate the occult energies of chemistry. We join hands with Prov-

idence to produce our harvests. The American fruit grower, like the American farmer, should hold his head proudly, but reverently, as the best of the world. As I look at it, there is no man on earth that outranks the well-equipped and competent American farmer and American fruit farmer. But equipment of knowledge and intellectual competency means a great deal."

Reference was made in the preceding section to the fact that fruit dried in the sun in Santa Clara County is superior in appearance and in quality to fruit dried by machinery. This deserves a more extended notice than could be given to it in that place, where it was stated only to explain the fluctuations in the number of fruit trees planted during the season of the five preceding years. It constitutes, in fact, one of the most important advantages which Santa Clara County has over all other localities as a fruit-producing district, and as such it merits the consideration of every one who proposes engaging in that industry, or who desires to appraise rightly the economic value of the climate.

The worth of sun-dried fruit depends upon the conditions of the climate in which it is dried. In moist climates, or in lands where there are frequent showers during the season of drying, fruit cured in the open air is comparatively valueless. The air of Santa Clara County, however, during the whole of the harvest season, is free from moisture, the barometer registering a very low degree of humidity. In fact, so dry is the atmosphere that fruit has been perfectly cured in the shade by subjecting it to a draft of cold air. It is this dryness of climate which gives the sun-dried fruit of the county its preëminence in the market. The fact itself is beyond contradiction. Prior to 1887 sun-dried fruit in the Eastern market was rated at about 50 per cent less than that cured by machinery. This rating was due to the comparative merits of sun-dried fruits as were known to the East, where the climatic conditions are such that fruit cured in the open air is neither of a good quality as regards flavor and nutriment, nor of a good appearance as regards color and form. When, however, the fruit of Santa Clara County, dried in the sun, was shown them, it immediately caused a change in the rating, and took precedence in price of all other kinds of dried fruit. Prior to that year efforts were made to have the prune crop of California cured after the French method. It was said that only by adopting this method of curing could our prunes compete successfully with those imported from France.

Many prune growers did adopt that system, which consists in partly cooking the prune while preparing it; but others found it impossible to do so, and sent their sun-dried prunes to stand on their merits in the market. It was soon seen that the sun-dried fruit had more nutriment and a better flavor than that prepared by machinery. Much of these are lost in the cooking process of the French system of curing, while the sun simply takes the water from the prune, leaving all the rich juices unimpaired in taste and quantity. As a result of this competition, California fruit commanded in the Chicago market last season from 1 to 3 cents a pound more than the French prunes; and while this is largely due to the superiority of the fruit itself, yet it demonstrates that fruit cured in the open air, by the cheap process of the sun, in Santa Clara County, need fear no competition with fruits which, in localities

less favored by climatic conditions, require for their proper preservation to be cured by machinery.

This confers a double advantage on the fruit growers of the county. In the first place, it enables much larger crops to be prepared for their market than would be possible if the fruit had to pass through evaporators; and in the second place, as the sun and climate are free to all, it gives the orchardist of small means the same facilities for drying his fruit as are possessed by richer men, who from the extent of their orchards and their wealth are able to have evaporators of their own. Nor are these advantages of slight monetary value. During the past season green apricots sold in Santa Clara County for \$25 a ton, while the dried fruit brought from 10 to 12 cents a pound, or about \$200 per ton. As it takes five tons of green fruit to make one ton when dried, this leaves a profit of \$75 a ton over what is received for the green fruit. The cost of drying in the sun does not exceed \$6 a ton, the only expense being for the sulphur box and the trays. The difference in prices between the green and dried fruit will, in a single year, yield a profit sufficient to pay for the whole plant needed for sun-drying. This being the case, nearly all the evaporators in the county are now laid aside and are used only in emergencies where rapid drying is necessary.

Prune growing is the largest, and taking one season with another, is the most profitable fruit industry in the county. The prune, like the grape, grows with equal luxuriance in the valley and on the foothills, and fully one half of the whole area of the county is suitable for its production. There is no fruit in the world so easily cultivated, so readily handled, so conveniently prepared for the market, and so remunerative as the prune, when cultivated in a soil and climate suited for it. In these respects Santa Clara County cannot be excelled, either on the eastern or western hemispheres, as here is the only place where it grows and ripens to perfection. Being thus, it constitutes a bonanza for this county, and is a never-failing source of wealth.

A feeling that packing prunes must be done under Government inspection is beginning to prevail. All acknowledge the impossibility of getting uniform grades by the present process. For instance, one man may, by extra care, get a high grade and get a corresponding price. Having created a demand for first-class goods, he cannot supply it from his small orchard. The careless packer interposes his stock, gets a price based on the other's good article, and works him a final injury. There are too many in all the departments of fruit business that force poor goods on the market, injuring the general trade.

Olive growing is destined to become one of the greatest, if not the greatest industry of Santa Clara County, and as such merits an extended description. There are as yet few who realize the value and advantages of an olive orchard, but the people are coming to understand them, as attested by the numerous trees set out during the past five years, and especially during the twelve months just completed. It is only a question of a few years when the olive orchards of the county will rank in extent with those of the prune, the apricot, and the vine.

The Mission olive was among the first of trees that were introduced into California. It was brought here from San Blas, Mexico, by Don Joseph de Galvez, during an expedition to rediscover the port of Monterey. The first planted in this county were at Santa Clara, January 18, 1877.

Next after the prune, the apricot is the largest orchard industry in the county, and is immensely profitable. Apricots were first planted in the county at the old Mission of San José, in the days long before an American set foot in the valley. They thrive mightily, and in the early days were noted over the length and breadth of the State for their large size and sweet lusciousness. But few trees of this variety were ever planted by Americans until 1858, when a large orchard was planted in The Willows, on the Zarilla tract, a large portion of which were apricots. These showed that this valley contained the proper soil and climate for the fruit, but the planting of apricots was small until it was demonstrated by D. C. Vestal what excellent ones could be grown there. In 1869 Mr. Vestal set out three acres of Moorpark apricots. The size and flavor of the fruit was so pleasing that the Moorpark came into universal favor, and the years following many extensive orchards were planted. Mr. Vestal has one tree on his place which is thirty-six years old, and has failed in its crop only three times since it came into bearing. This is remarkable, for anywhere outside of this valley the Moorpark is a shy and irregular bearer. The fruit is always in demand, and the demand is constantly increasing as the consumers become acquainted with its deliciousness. The fruit nowhere grows to such perfection as in this valley, and the work of canning it is one of the chief industries of the valley. Either dried or canned it is beyond comparison as a table fruit. It is easily and cheaply dried in the sun, and when thus preserved brings from 10 to 12 cents per pound, so that with but very little trouble, the growers can greatly increase their profits. Many of them do this, while others sell the fruit on the trees to the canneries, and thus save all bother. The apricots of this county reach a perfection unattained elsewhere, and are almost without competition. They frequently grow from 6 to 9 inches in circumference, and it is difficult to see how their flavor could be improved.

Peach growing is another of the industries for which this valley is famed, and justly so, for here this delicious fruit has an added deliciousness and flavor not found elsewhere. It ranks with apricot growing in point of extensiveness and pecuniary remuneration.

This was also one of the fruits planted by the early Mission fathers, and peaches from their orchards sold in San Francisco for a dollar each in the early days. After the disastrous season of 1868, for apples and pears, the attention of orchardists was more particularly attracted to other fruits, and in the heavy plantings of succeeding years the peach was largely a favorite. This county now contains some of the largest peach orchards in the State.

All the favorite varieties of this delicious fruit ripen here into the full perfection of sweetness and flavor. The soil and climate are peculiarly adapted to it, and it thrives both in the valley and upon the foothills. The tree here grows to an old age, full of vigor and life, not having to endure the cold winters and other causes which, in the East, make it necessary to renew peach trees every four or five years. Trees here of the age of 30 years are not unusual nor infrequent, and they have grown full crops every season since they came into bearing. The shoots upon some of them are still 10 feet in length, fully demonstrating that there is still plenty of life in the old trunks, and they will further enrich their owners before going on the superannuated list.

Three years after planting the trees yielded a good crop, and there-

after their capacity for bearing was only limited by their ability to maintain the weight of fruit. Some trees have come into bearing at two years, but this is unusual and but seldom the case. In every orchard props have to be used, and in numerous cases trees break down every year from the immense weight of fruit. Proper pruning and care will obviate this. It is usual for orchardists to thin out the fruit shortly after it has formed on the branches. Though the number of peaches then obtained is less, this is more than compensated for by the larger size and more exquisite flavor of those remaining.

Their splendid appearance, large size, and unexcelled flavor have given them an enviable reputation, and the demand is always good and steady.

Santa Clara peaches in the green state find a ready sale in San Francisco and the East. Variety after variety succeeds, and ripe peaches may be had until late in November.

Plum growing is not as extensive as some of the other fruits. In any other spot it would be considered highly profitable, but the enormous profits yielded by other fruits overshadow the more modest income from this branch of the fruit industry. It pays well, however, and by giving a variety to the orchardist, assures him a crop when his peaches or apricots chance to have an off year.

Quinces are but sparingly grown in this valley, there being comparatively so little profit to orchardists in growing such fruit, because of the lack of a steady market. Yet this valley can and does produce quinces of the very best quality. The tree is a good grower and produces fruit in abundance. Wherever planted the trees have thriven mightily, and the fruit has been large and of fine flavor. The fruit is chiefly cultivated in family orchards for home use, and also by those who wish to have the largest possible variety of fruits.

On account of the extra labor in preserving, the canneries do not use the fruit at present, and even in its green state there is very little demand for it in the market. Some of the canneries intend soon to make preparations for using it, putting it up in the form of jelly and preserves.

When such is done quince growing will be immensely profitable, for the trees bear heavily, are long lived, and require little or comparatively no care. It grows equally well in the valley and on the foothills, and is in every way a desirable fruit for the orchardist to cultivate.

Almond culture is an industry which is certain in the near future to be extensively followed in this county, and the crops now obtained are highly profitable. In no portion of the State have these trees grown so thriftily or yielded so well as in that portion of the valley lying along the western foothills around Saratoga and Los Gatos. In this section the nut reaches a perfection of size and flavor that is not equaled anywhere else, much less excelled.

In 1873 a large almond orchard was planted, covering all the land upon which now stands the city of Los Gatos. This land then was considered of but little account, and the success of the experiment was far beyond the most sanguine expectations of the planters. At the present time nearly 1,000 acres are planted in almonds in this county. They form a part of almost every orchard.

Apple culture in this county is not what it should be, nor what it surely will be. When the adaptation of the soil and climate of the valley for

fruit was first seen by the early Americans, large orchards were planted, and the majority of these were apples. In 1868 apple culture received a disastrous blow. The market was glutted, and the major portion of this fruit rotted under the trees. Also about the same time it was demonstrated that other fruits could be grown more profitably in the rich lands of the valley, and the result was that most of the apple orchards were dug up or other fruits grafted to the stock.

The apple does not thrive on the rich lands and in the warm levels of the valley in such a manner as to be profitable. The tree grows well, and the crop is enormous in quantity, but the quality is not so good as is desirable. Experiment has shown, however, that the foothill region, the higher foothills, and much of the mountains, are admirably adapted to the apple, and that as fine fruit of that kind can be raised there as anywhere in the world.

Pears are one of the chief glories, among the many which this county boasts, in the fruit line. They were the first of California fruits that were shipped to the East, and their exceedingly large size and unusually delicious flavor created the greatest astonishment and admiration. The fruit created a special market of its own, and has continued foremost ever since. California pears have no rival as a fresh fruit, canned, or dried, and the demand far exceeds the supply.

All the choice varieties in the world have been transplanted to Santa Clara County, and our enterprising horticulturists have originated many more. Many of the best pears now in the market were first grown there, and several of them have been transplanted to the orchards of the East. The fruits need a moist soil and can be grown in any part of the county, but thrives best in the Santa Cruz Mountains, where they attain to enormous size.

The fruit is readily marketed; large quantities are shipped East, where they are in great demand, but the canning companies take up far the largest portion of the crop. The fruit, as grown here, is particularly adapted to shipment. Being grown on vigorous trees in a fertile soil, and in a climate free from moisture, they will keep in good condition and retain their flavor for several months. Pears from Santa Clara County stood on the tables of the New Orleans Exposition during the entire exposition without having to be renewed and without losing their bloom and plumpness. The pear tree begins to bear in the third year, and in the fourth will pay for the cost of cultivation. It is not until the sixth or seventh year, however, that they are in full bearing. The finer fruit is in very great demand, and sometimes it brings as much as 5 cents a pound. R. D. Fox in one season sold the fruit from 150 Easter Beurré pear trees for \$1,500.

The Bartlett pear belongs to the choicest fruit that is grown, and reaches its greatest perfection in certain sections of the valley. They require a moist, rich soil, and thrive on land adapted to no other kind of fruit. A thousand boxes of pears to the acre is not a large yield, and \$1 a box, or 2½ cents a pound, is an average price. Other varieties are grown, viz.: The Winter Nelis, Beurré Hardy, etc., but the Bartlett is the best. There were plenty of Bartlett pears grown in this valley this year that weighed a pound and a half each.

Cherries are grown in the Santa Clara Valley on a large scale, and some of the profits yielded are almost beyond belief. The tree flourishes

on every soil in the county, except that where water stands in the winter time.

Taking one year with another, there is no fruit that gives more satisfactory returns than the cherry. The best results have been gained on rich, not too light, valley land. Adobe is not so well suited to the cherry as a lighter, more friable soil. On the other hand, a soil containing too much sand or gravel is not good. In all respects the soil of "The Willows" peculiarly fits the cherry, and there it is perfectly prolific and yields the most lucrative crops. The fruit of the cherry tree attains, when ripe, to a size and flavor unknown in any other land, and every variety of black, red, and white grows with the same luxuriance and profusion.

Even in this glorious place, under the best conditions obtainable, the trees are slow in coming into bearing. A full crop cannot be expected until the trees are seven years old. However, it is then more profitable than either the apricot or prune.

With proper handling, cherries are one of the best shipping fruits. While many parts of the State produce good cherries, the area of land suitable for such is much less than for many other fruits, and none can equal those of the Santa Clara Valley, so that there is always a steady and profitable market for all our cherries.

The fruit is the first to ripen in the valley, and the harvest of the crop begins in May and continues for some months. As it brings in the first money of the year it is much favored by growers, and there are few orchards which do not contain a fair percentage of cherry trees. As a consequence the product of the county is very large, some single orchards shipping as much as 30 tons in a single season.

Fig culture is one of the oldest industries in the county, the trees having been planted by the Franciscan fathers at the Mission more than one hundred years ago. The trees thrive and have much fruit. They were originally planted more as shade and ornamental trees than anything else, but the perfection to which the fruit attained demonstrated that the conditions here were suitable to the culture of figs of the finest quality. The varieties first planted were not suitable for commerce, and so later plantings have been of the commercial varieties of Smyrna and the Adriatic. These have fruited in the most satisfactory manner. The crops are heavy, and the fruit is inferior to none in the world.

Citrus fruits have never been grown in Santa Clara Valley for the money there is in them, although fine qualities of fruit are produced. There is so much more money in other fruits that these are at present out of the question with growers. However, there is a considerable number of acres planted in them—taken altogether, enough to show that the valley could make a record in this line if it were necessary. In 1888 the National Horticultural Society held a convention in San José, during which a citrus fair was held. The display made was a remarkable one, and surprised even old residents of the county.

The berries all do well. The strawberry is especially prolific in the low lands near the bay. It gives immense yields, which always bring good prices. There was a time when the major portion of "The Willows" was planted to strawberries, but they found they could not compete with the growers in the low lands, for the latter, by artesian wells,

secured water for irrigation without further trouble, while the others had to raise the water to the surface.

Fully 700 acres are planted to this berry. The vines are set out along the sides of the ridges between the irrigating ditches, and the center of the ridge is planted with onions, or some other small vegetables.

Blackberries are raised much in the same region as the strawberry, and about in the same way. Large quantities are canned annually, but greater portions find a ready and steady sale in San Francisco in a fresh state. The blackberries are not confined so much to the low lands. In the cañons and upon the sides of the mountains it grows prolifically and is an abundant bearer.

The raspberry is a delicious fruit, which grows to full perfection in this county. It is cultivated in almost every garden, and never fails to produce a large crop of berries each year. The raspberry is cultivated similarly to the blackberry, and thrives in the same localities.

Currants thrive remarkably well and yield good returns. Gooseberries are not so much cultivated, but when attention has been paid to them they do fairly well.

Nuts are not grown to any great extent. The English walnut, to which most attention has been paid, does well here. Other nuts, as the pecan, chestnut, and other varieties have been grown to a limited extent for ornament, experiment, or family use, and all seem to do well.

ACREAGE AND VARIETY OF FRUITS IN SANTA CLARA COUNTY.

Variety.	Acres in Trees.			Plant of 1892.
	Bearing.	Non-Bearing.	Total.	
Apple	500	250	750	72
Apricot	2,900	1,450	4,350	384
Cherry	850	400	1,250	120
Fig	12	8	20	2
Olive	90	45	135	15
Peach	3,458	2,112	5,570	70
Prune	5,000	3,000	8,000	426
Pear	600	300	900	120
Plum	575	325	900	74
Quince	40	—	40	—
Lemon	3	2	5	1
Orange	25	15	40	3
Nuts—Almond	130	70	200	20
Walnut	10	7	17	2
Raisins	200	—	200	—
Table grapes	1,200	—	1,200	—
Small fruits	360	—	360	—
Totals	15,953	7,984	23,937	1,309

SANTA CRUZ COUNTY.

Santa Cruz County fronts its entire length on the Pacific Ocean, and lies midway between Oregon on the north and Lower California on the south, and is in the heart of Central California. Its boundaries, besides the ocean on the west, are San Mateo on the north, Santa Clara on the east, and Monterey on the south. It is separated from San Mateo and Santa Clara Counties by the Santa Cruz Mountains, and from Monterey

by the Pajaro River. It has an area of 437 square miles, or 280,000 acres.

It is the smallest county but one in the State, and comprises a narrow strip of mountainous land about 40 miles long and 18 broad, forming a vast amphitheater, and sloping from the summits of the Santa Cruz range, whose highest elevation, Loma Prieta, is 4,000 feet, southward and westward to the bay of Monterey.

The curving line of shore and the corresponding curve of the mountain line inclose an irregularly crescent-shaped tract of country, with an average width of 20 miles, which for grandeur, beauty, and variety of scenery equals any tract of similar size in the world.

The innumerable ridges and spurs of the Santa Cruz range are intersected and furrowed by gorges, cañons, and narrow valleys, trending for the most part seaward. The sides of these are closely set with forests of pine, redwood, madrona, and other trees, the redwoods having, in many cases, attained gigantic growth. A number of streams rise in these hills, and bring down with them the rich alluvial loam into the valleys, which, in their normal condition, are smiling with native grasses and flowers, and as soon as "tickled with a hoe" yield phenomenal agricultural results. These streams are, agriculturally as well as topographically, a very important feature of the county, watering as they do every section of land. Besides these larger streams, springs of water are almost innumerable.

Nearing the coast there are many interesting topographical features. The leagues of wide, high, wind-swept grassy plateaus which form our remarkable grazing and dairy lands; the succession of chalk terraces; the broad, amphitheatrical valley of the Pajaro; the salt lagunas, picturesque in configuration, and surrounded by park-like groves of live oaks; the high sandstone cliffs along the shore; the magnificent ocean drives—all material for pleasant investigation.

Along the coast-line (except in the northwestern corner of the county, at which point the mountains come down nearly to the water's edge) a series of raised beaches form a strip of more elevated land along the seashore. This widens to the south of the city of Santa Cruz, and affords a large area of fruitful soil, which has been brought into a high state of cultivation.

From Santa Cruz City southward the soil consists of a light loam, abounding in lime, potash, and phosphoric acid. In the Pajaro Valley a great variety of soil is found, from the rich sedimentary alluvial wash to the light sandy soil of the foothills. In the lower part of the valley a clayey loam predominates. This is followed by a heavy adobe higher up, and then the dark, reddish loam of the plains. The latter is the favorite with the fruit growers, and it is here that the best orchards are found.

Of the climate, the "Surf," published at Santa Cruz, says:

"The climate is acknowledged by all who have given it a trial, and who know other parts of the world, to be the most equable and invigorating known anywhere. The range of the mercury is from 28° to 88° above zero, with a difference of only 10° between the mean temperature of the three warmest and the three coldest months. The place is sheltered from north winds by the crescent-shaped range of mountains on the landward, while the milder breezes of the Pacific have free access. The proximity of the mountains gives an almost endless variation of ele-

vation, exposure, and aspect, which are as favorable to the great industries of vine and fruit growing as to the preservation of health. The scenery of the entire county presents a greater variety of grandeur and beauty than any tract on the globe. Mountain and marine views, dense forests, gloomy gorges and cañons, sunny, flower-filled valleys, lakes and mountain streams are the more important features. That famous group of redwoods, the Big Trees, of which the largest one is 300 feet in height, 60 feet in circumference, and 109 feet from the ground to the first limb, is 5 miles from the city."

The following table, compiled by W. R. Springer, Observer for the Signal Service Bureau, for 1891, will give a good idea of the average climate of Santa Cruz:

	Jan.	Feb.	Mar.	April.	May.	June.
Highest barometer.....	30.37	30.39	30.20	30.23	30.10	30.14
Lowest barometer.....	29.86	29.20	29.90	29.75	29.79	29.80
Mean barometer.....	30.16	29.97	30.66	30.04	29.98	29.93
Range for month.....	.51	1.19	.30	.48	.31	.34
Greatest daily variation.....	.18	.52	.29	.20	.11	.11
Least daily variation.....	.00	.00	.00	.00	.00	.00
Highest temperature.....	68	62	72	78	73	92
Lowest temperature.....	28	30	34	36	42	42
Mean monthly temperature.....	49.25	47.1	55.4	54.4	58	62.3
Monthly variation of temperature.....	40	30	36	42	31	50
Greatest daily variation.....	29	26	29	35	28	38
Least daily variation.....	13	5	5	11	9	14
Coldest day of month.....	41.5	44.75	48	48.5	55	57
Hottest day of month.....	55	58	60	61	62.5	70
Highest humidity.....	78	86	83	78	82	78
Lowest humidity.....	35	44	39	59	58	48
Mean humidity.....	62.5	66.5	65	67	69.1	64.2
Cloudy days.....	2	10	7	7	6	1
Partly cloudy days.....	11	11	10	9	19	4
Clear days.....	18	7	14	14	6	25
Rainfall.....	.77	10.68	1.36	2.57	.60	.10

	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Highest barometer.....	30.08	30.10	30.12	30.22	30.37	30.59
Lowest barometer.....	29.84	29.87	29.83	29.84	30.05	29.77
Mean barometer.....	29.94	29.98	30.13	30.82	30.15	30.26
Range for month.....	.24	.23	.23	.38	.32	.82
Greatest daily variation.....	.10	.09	.10	.17	.17	.31
Least daily variation.....	.00	.00	.00	.00	.00	.02
Highest temperature.....	92	100	92	89	80	69
Lowest temperature.....	48	46	39	38	31	25
Mean monthly temperature.....	44	64.9	61.8	58.9	54.7	48
Monthly variation of temperature.....	44	54	53	51	49	44
Greatest daily variation.....	37	46	42	42	41	41
Least daily variation.....	14	15	19	8	9	10
Coldest day of month.....	59	59	55	53	49	38
Hottest day of month.....	71	70	68	64	63	56
Highest humidity.....	88	76	79	83	84	77
Lowest humidity.....	50	52	55	29	43	40
Mean humidity.....	68	66.2	70.7	64	62	60
Cloudy days.....	1	0	1	4	4	12
Partly cloudy days.....	13	12	6	8	15	15
Clear days.....	17	19	23	19	11	4
Rainfall.....	.00	.00	.70	.45	.58	7.60

While Santa Cruz is not in the foremost rank among the horticultural counties of the State, to it belongs the honor of being among the first to introduce that industry to California, a nursery having been established here as early as 1846 by A. A. Hicox, who brought cuttings across the

plains carefully sealed in bottles. With these he grafted seedlings obtained from the old Mission orchard at Santa Cruz, and so became possessed of a large and profitable orchard. A few of the old trees yet remain on the old Hicox place at Santa Cruz and continue to bear good fruit.

Most fruits do well in Santa Cruz County, and especially in the Pajaro Valley. The apples of the mountains and Pajaro Valley rival anything in the Union. The crop is a sure one, and the yield exceptional. Ten boxes (50 pounds each) to a tree from orchards in full bearing is the average, while twenty boxes per tree is by no means exceptional. Prunes of the best varieties are largely cultivated, and the dried, evaporated, and canned products find ready sale. Olives, it is believed by many, will eventually take the lead, and large orchards are being added yearly. Mountain apricots are exceptionally fine. Cherries are immense in size, and fine in flavor and yield. Peaches, though not grown largely as a commercial product, are an adjunct to every orchard, while pears are phenomenal in size, and a most profitable crop. The English walnut and almond are growing in favor, and are largely cultivated. The citrus fruits are successfully cultivated for home use, but not commercially so far. The small fruits prove fortunes to their growers; 2,000 tons per year is the shipment of strawberries from the Pajaro Valley alone, and they are in the market nine or ten months in the year. Raspberries and blackberries are quite as successful.

Viticulture, both as to the growing of wine and table grapes, has easily taken a leading place. The conditions for the successful growth of the rarest and choicest table grapes, and for the production of the best light dry wines, are absolutely perfect. The table grape season is long; the vintage of Santa Cruz Black Hamburgs, Verdals, Flame Tokays, Muscats, and others continue through November and December, and they are found latest in San Francisco markets. Twenty-two tons to the acre of Verdals is the maximum yield, but not exceptional. Ten tons per acre is an average for all grapes. The wines of this county, especially claret and dry white wines, are making an enviable name, and the manufacture steadily increases.

The principal sections devoted to fruit in Santa Cruz are the Pajaro Valley and the Santa Cruz Mountains, and the varieties chiefly produced are apples, prunes, apricots, and peaches. In the valley apples, prunes, pears, and berries find the best conditions, while in the mountain section prunes and grapes are the favorites. A ready market for all the surplus fruit of this county is found in San Francisco, being generally sold in the orchard to jobbers, who pick and sack it for the market. Some fruit is exported from Santa Cruz direct to Japan, Mexico, and Arizona.

M. B. Tuttle, at Watsonville, reports having sold his entire crop last year at \$100 per acre, on the trees. These are chiefly apples, and are eight years old:

	Acres.	Selling Price.
Apples.....	24	\$3,500 00
Cherries.....	2	200 00
Apricots.....	7	325 00
Totals.....	33	\$4,025 00

These prices were for fruit on the trees, the purchaser picking and packing the crop. The trees in this orchard are from four to ten years old.

Santa Cruz reports the present season's crop as averaging good. The apple crop was especially good, and other varieties fair. The inclement weather of last spring did not affect Santa Cruz to the same extent that it did the majority of the other counties of the State. One of the oldest nurseries in the State is located at Watsonville. The Pajaro Valley Nursery was established by J. A. Blackburn and James Waters in the year 1866, near the town of Watsonville, Santa Cruz County; 5 acres were planted in trees the first year, comprising a general assortment of fruit trees, mostly, though, of apple trees. Stocks and seedlings were at that time very difficult to be had, and what could not be grown there for the want of seed had to come from the East, or France, via the Isthmus, a long, tedious trip, passing through a tropical climate, which not only at times seriously injured the plants, but often killed them entirely. Another difficulty presented itself, which was to get buds and cions of the different varieties true to name. At these times little fault could be found with the prices at which trees sold, for they were about as follows (all trees had to be two years old): Apples, \$30 per hundred; pears, cherries, and plums, \$50 per hundred; peaches, \$40 per hundred, etc. Monterey cypress, pine, and Italian cypress sold at the modest price of \$1 to \$1 25 each, such as are now sold for 15 and 20 cents each.

The business was conducted with varied success by Blackburn & Waters until the year 1875, when Mr. Waters bought out his partner, and shortly afterwards moved to another piece of land situated within the corporate limits of the town of Watsonville, where he continued the business until a year or so ago, when he bought a piece of land near the Pajaro depot, Monterey County, and now has closely planted in nursery 65 acres of trees. The land is the finest of the productive Pajaro Valley.

This nursery is devoted almost exclusively to the growing of fruit trees, comprising not only all the old and standard varieties, but also those of recent production which are found to be worthy of cultivation. The nature of the soil and climate in this valley is such that no irrigation is needed. It is a specialty of this nursery that all trees and plants are grown naturally without the use of water. The Pajaro Valley Nursery is one of the oldest in the State, and has been, from its first establishment, under the proprietorship of its founder.

In the Pajaro Valley a large area is devoted to berry culture, and small fruits do exceptionally well there. There are 75 acres of strawberries grown there, and on the Monterey side of the river 25 acres more. The acreage of small fruits is: Strawberries, 100 acres; blackberries, 129 acres; raspberries, 71 acres; total, 300 acres, all grown without irrigation.

ACREAGE AND VARIETY OF FRUITS IN SANTA CRUZ COUNTY.

Variety.	Acres in Trees.			
	Bearing.	Non-Bearing.	Total.	Plant of 1892.
Apple	719	900	1,619	300
Apricot	310	370	680	120
Cherry	159	181	340	50
Olive	4	120	124	3
Peach	351	421	772	100
Pear	917	1,065	1,982	320
Prune	194	139	333	57
Pear	3	10	13	5
Nuts—Walnut	1,253		1,253	
Table grapes	260		260	
Small fruits				
Totals	4,181	3,206	7,376	955

The assessed value of trees in Santa Cruz County is \$154,615.

In Laurel district fruit is not raised in any large quantity. The land is covered mostly with timber, and wood and lumber are the only exports.

The district comprises about 1,800 acres, of which not more than 100 acres are in fruit, and those are divided into small orchards and vineyards.

The soil and climate are very favorable for fruit growing, and grapes, peaches, apples, etc., thrive.

Many springs and creeks give an abundant water supply.

The few fruit trees in the district are, so far, perfectly healthy, no injurious insects having made their appearance.

SHASTA COUNTY.

Shasta County is situated at the head of the Sacramento Valley, between parallels of latitude 40° 20' and 40° 15' north, and longitude 120° 20' and 123° west. It is bounded on the north by the counties of Siskiyou and Modoc, on the east by Lassen, on the south by Tehama, and on the west by Trinity. Its greatest length from east to west is 90 miles, and its greatest breadth from north to south is 60 miles. Its area is 3,765 square miles, or 2,500,000 acres.

The mountains of the Sierra Nevada and Coast Range cover a large portion of the county on all sides except the south. They are rugged and lofty, rising more than 5,000 feet above the sea. On the east there are four peaks of special prominence, that stretch far into the county from the Sierra, separated from each other by a space of from 10 to 12 miles. Lassen Peak has an altitude of 10,577 feet, and is timbered for two thirds of the way up; the others are bald, and usually covered with snow. Other peaks and buttes are numerous, and all indicate volcanic origin, as shown by extinct craters, cones, sulphur deposits, beds of lava, etc. Hot and boiling springs are also of frequent occurrence.

In the southern portion of the county is a foothill region, half circular in shape, forming the northern end of the Sacramento Valley proper, and embracing about 500,000 acres, the altitude of which is from 500 to 2,500 feet above the level of the sea. The southwestern portion of this foothill region is a succession of rounded hills, varying in height from 50 to 200 feet above the level of the sea. The central and southern por-

tions consist of table-lands, varying in altitude from 500 to 700 feet above sea-level. It has many narrow valleys. From this section eastward there is a gradual ascent to the mountains, embracing the higher foothills of the Sierra.

Shasta is noted for the number and beauty of its streams. First in importance is the Sacramento River, flowing through the county north and south; all but 20 miles of its course in the county is through a rocky cañon. The McCloud River, bursting from Mount Shasta's side, rushes through the mountains of the north in a southerly direction and empties into the Pitt River. The most beautiful stream of the north-east is Fall River. In its meanderings it is 40 miles in length, and empties into Pitt River. Besides these larger streams there are a score of tributaries or creeks, while springs abound in the foothills and mountains. Among the minor streams are Hat Creek, Roaring River, Hatchet Creek, Montgomery Creek, and on the north, Squaw Creek, McCloud River, and the Little Sacramento. These three have many features in common. They take their rise in the highest mountains around Mount Shasta, flow south, are clear, very cold, and very rapid, each about 100 miles in length, and fall into the Pitt River within a distance of 15 miles. Below this point comes Clear Creek from the west, Churn Creek, Stillwater Creek, Cow Creek, and Butte Creek from the east, the last forming the boundary between Shasta and Tehama Counties on the east, as Cottonwood Creek does on the west. Cow Creek is a large creek, having many branches, all rising in the high Sierra. Battle Creek receives the waters from the west side of Lassen Butte, as does Hat Creek on the east side. These two creeks have sources close together; each is from 30 to 40 miles in length. The former empties into the Sacramento River, the latter falls into Pitt River 80 miles above, at an elevation of 2,500 feet. Besides these streams there are a great many others of smaller size. Numerous springs are found, and water in abundance for all needs exists.

The soil of the valleys is an alluvium, a rich sedimentary deposit, largely intermixed with disintegrated rock, and in some parts with a mixture of gravel. The usual color is a light red or reddish brown. The soil is very fertile, and is found excellent for plums, prunes, pears, figs, and small fruits. The mesa lands bordering the valleys are, as a rule, composed of a sandy loam, with a large percentage of clay, and carrying in many portions, especially in the higher parts, considerable gravel and boulder. Fruit of nearly all kinds does well on these mesa lands. On the foothills is found a red loam or clay, very productive, and excellently adapted to the growth of berries. On the elevated plateaus of the north and northwest the soil varies from a black, sandy loam to a red loam or clay, while to the southwest the soil is generally adobe, found very productive of grain and rich in natural grasses.

Almost any desired climate may be found, from the semi-tropical to that in which the cold winter and short summer prevail. The rainy season, which begins in September, is the most delightful part of the year. It is perfectly clear and warm between rains. In the higher altitudes the climate varies. The general range of cold is about 90° above zero. Snow storms are frequent, but not heavy or of long duration. The ground never freezes more than an inch or two in depth. The foothills have an excellent climate, neither an extreme of heat nor of cold. In the valleys in the east and northeast portions of the county

the seasons—summer and winter—are similar to those of the Eastern States, only less in the extremes of heat and cold. During June, July, and August the thermometer ranges from 70° to 102°, and it is pretty warm; but in December, January, and February it never goes lower than 18° above.

The following statement of average monthly rainfall, in inches, covers a period of five years, and was kept at Reeds Camp, on the Upper Sacramento: January, 12.400; February, 7.480; March, 11.454; April, 10.880; May, 3.750; June, 1.956; July, .066; August, none; September, .660; October, 6.106; November, 3.442; December, 13.590; yearly average, 71.784.

The table given below shows the average precipitation for the same period at different points in Shasta County:

	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Delta.....	8.28	2.27	13.95	12.52	6.33	3.56	.12	.00	.05	7.69	4.62	4.09
Fort Crook....	3.86	3.19	3.52	1.59	1.25	.57	.25	.02	.39	.97	2.81	5.10
Fort Reading..	4.88	3.27	3.91	3.92	2.85	.13	.00	.06	.16	.69	3.20	5.78
Redding.....	8.04	4.88	5.35	3.25	1.53	.48	.06	.08	.46	3.01	4.07	5.46
Reeds Camp...	12.40	7.48	11.45	10.88	3.75	1.95	.06	.00	.51	4.80	5.00	9.85

Irrigation is unnecessary for most crops in many portions of this county, as the rainfall is sufficient for all ordinary purposes. The rainy season begins, as a rule, in September, never later than October, and extends, at intervals of two or three weeks, from that time until the middle of the following June. During the entire time the ground is thoroughly saturated with moisture. This rainy period covers the whole of the growing season in California. At the end of the rainy season grains, grasses, etc., are ready for the harvest, and fruits, grapes, etc., are beginning to ripen. Now follows the dry season, embracing the months of July, August, and September. Under a cloudless sky crops are harvested and stored away, and fruits mature and acquire the delicious flavor for which they are noted. The dry season is just as much of a necessity as the wet, for only under these conditions can perfect grain and fruit be grown.

There are several important canals in Shasta used for irrigating and stock purposes, and a district has been organized in Happy Valley under the Wright law, covering 20,000 acres. Negotiations are pending for the purchase of existing ditches for this district, the company now owning the water offering it for \$50,000. Existing canals, with their mileage and assessed value, are given below:

IRRIGATION WORKS IN SHASTA COUNTY.

Name.	Miles.	Value.
Bee Creek Ditch (irrigating).....	15	\$1,500 00
Clear Creek Ditch (mining).....	40	5,000 00
Eagle Ditch (mining).....	12	2,400 00
Taylor's Ditch (irrigating).....	3	3,000 00
All other ditches (irrigating).....		7,500 00
Totals.....	70	\$19,400 00

While there are many old trees in Shasta County, and enough has been done experimentally to prove that, when she will, Shasta can take rank as a fruit county, but little has been done towards giving her commercial importance in this branch. At Wiser's place, 5 miles north of Redding, there are orange trees that are ten to fifteen years old, which have borne profitable crops for years.

During the past few years a number of orange trees have been planted in different portions of the county, and all have done well. Deciduous fruits do remarkably well wherever proper care has been given them. Among the fruits which grow in Shasta are peaches, pears, figs, nectarines, apricots, pomegranates, cherries, prunes, Japanese persimmons, almonds, walnuts, chestnuts, apples, plums, prunes, pears, and berries of all kinds. Of late years more attention has been given to fruit growing in Shasta than was formerly bestowed upon it, and it will not be long before she will take her proper rank among the horticultural counties of California. At Anderson some extensive orchards have been planted, and at that place is probably the largest apple tree in the State. It is on the Redding grant, and was planted in 1857. Its circumference 18 inches above the ground is 5 feet, and last year its owner, Mr. P. R. Tolten, gathered from it 3,000 pounds of fruit.

The preference of Shasta orchardists leads to peaches, prunes, apricots, figs, pears, olives, apples, and nectarines. The other deciduous fruits and some citrus fruits are grown, but not to any great extent. The principal markets for the green fruit of this section are found in Oregon, Washington, Idaho, and Montana. Last year Shasta shipped to Chicago 20 carloads of fruit, and this season fruit has been shipped in carload lots from Redding to Portland, Oregon.

For this season contracts were made for 31 cars to be forwarded to commission merchants, who sell on 7 per cent commission. This is the first year that fruit has been so handled in Shasta, but with the high prices ruling this year the experiment proved very satisfactory.

The chief fruit sections in order of importance are: Cottonwood Valley—prunes, almonds, peaches; Anderson—prunes, peaches, pears, and apples; Happy Valley—olives, peaches, prunes; Redding—peaches, prunes, pears, apples; Dry Creek—peaches and prunes. In all these sections other fruits are grown, but those mentioned predominate.

The larger part of the fruit crop of Shasta is dried and shipped in sacks, although much of the better quality was boxed this season, some of this bringing fancy prices, and some extra fine; boxed, seedless grapes, from Happy Valley, sold at 16 cents per pound in the Chicago market last season.

The present season's crop will range: peaches, below average; apricots, 75 per cent less; prunes and pears, 10 per cent less; apples, about average; all other fruits, average.

There has been some very extensive planting of new fruit in Shasta County during the past two years, and especially in the past season. This has been principally in the country adjacent to Happy Valley and Anderson. Of the new fruit, prunes predominate very largely, and almonds are next in favor.

Some old orchards are found in Shasta County. One is in existence at the Tower House, on the Weaverville road, that was planted in 1852. This consists of apples, pears, and walnuts, and the trees are still in good bearing. There is another orchard on the McMurray ranch,

planted by Jonathan R. Gilbert in 1860, which is still in good bearing condition.

ACREAGE AND VARIETY OF FRUITS IN SHASTA COUNTY.

Variety.	Acres in Trees.			
	Bearing.	Non-Bearing.	Total.	Plant of 1892.
Apple.....	97	---	97	---
Apricot.....	81	200	281	70
Cherry.....	12	14	26	3
Fig.....	8	---	8	---
Olive.....	20	17	37	6
Peach.....	526	300	826	93
Nectarine.....	7	3	10	1
Prune.....	280	400	680	100
Pear.....	73	10	83	2
Plum.....	2	3	5	1
Quince.....	1	---	1	---
Orange.....	6	20	26	5
Nuts—Almond.....	31	50	81	20
Totals.....	1,144	1,017	2,161	301

SIERRA COUNTY.

Sierra County is preëminently a mountain county. It is located wholly in the Sierra Nevada range of mountains, and has for its boundaries Plumas on the north, the State of Nevada on the east, Nevada County on the south, and Yuba on the west. It has an area of 781 square miles, or 500,000 acres. Of this 200 square miles may be described as foothill, and the remainder mountain. In elevation it ranges from 3,000 to 8,000 feet above ocean-level.

The face of the county is everywhere scarred by cañons, some of which have a depth of over 2,000 feet, and whose sides are very precipitous. The whole surface is very mountainous, and some of the highest mountains and ridges of the Sierra range are found within its limits. It is one of the best watered of the counties of the State, containing within its confines the north fork of the Yuba River, with its lesser forks and tributaries, the Feather River, and the Truckee River, the latter rising in the southeastern portion of the county, in Webber Lake. There are numerous lakes in the county. In the northern portion there are Bear, Spencer, Gold, Gray, Packer, Volcano, Young America, Upper Salmon, Lower Salmon, Upper Sardine, and Lower Sardine Lakes, and in the southeastern portion there are Webber, English, Eureka, and Meadow Lakes.

One of the peculiar topographical features of the county is the expansive valleys and lakes lying high up among the loftiest peaks of the Sierra. The lakes vary from one eighth of a mile to 3 or 4 miles in length, most of them circular in form, and considering their small size, remarkable for their great depth. Gold Lake is one of the most notable, having been the locality of a gold excitement as early as 1849. This lake, which is about 4 miles long and 2 miles wide, is the source of the middle fork of the Feather River. A great number of mountain springs and small streams are found throughout the county.

The most important body of land in the county is the Sierra Valley. This valley, which extends over the boundary line into Plumas County,

is the largest, and for its size the most elevated of the Sierra valleys, being 5,000 feet above sea-level. It is 30 miles in length, 10 miles in width, and of a semi-circular shape.

Some years snow falls to the depth of 20 feet on the high ridges, and hardly a season passes without an unfortunate wanderer losing his way in the furious storms that visit these mountains, and very often meeting his death. In the towns, people are obliged sometimes to communicate with each other by means of tunnels through the snow banks. The quantity and long duration of the snow necessitates the use of snowshoes, and races on them are as popular an amusement in winter as tobogganing is with the Canadians. The racing ground is usually on a long slope, down which the contestants slide, sometimes at the fearful speed of a mile a minute. The shoes (Norwegian skate) consists of thin pine boards, turned up at the toe, 4 inches in width and 12 or 16 feet long. During the warm season the temperature in the middle of the day is rather high, averaging from 80° to 90° in the shade; but the nights, it is unnecessary to say, are always cool, occasionally chilly. The present annual snow-fall is much less than in former years, due, in a measure, as scientists tell us, to the thinning out of the mountain forests.

The soil of the valleys is usually a deep, black loam, largely admixed with rich vegetable mold, the result of ages of forest growth.

Irrigation is resorted to in the Sierra Valley for the growth of most crops, and an abundance of water is found for that purpose. Of late years a large number of artesian wells have been bored, from which large flows of water are obtained, and this is used largely for irrigation purposes, for which they have been sunk. Their depth varies from 140 to 300 feet, and a large extent of land, otherwise worthless, has been brought under cultivation through them.

Writing of horticulture in Sierra County, S. B. Davidson, of Downieville, says:

"We are about 3,000 feet above sea-level, and upon river banks and cañons, with mountains on either side, 3,500 feet above us, whose tops are covered with scrub oaks, berries, acorns, scrub chestnuts, etc. Early spring and late frosts (usually partners in our mountains) destroy all fruits one year in four, hence orchards have not proved very profitable with us, except the *potato orchards*; these invariably pay profits and produce the finest potatoes in the world, but too far from the railroad. Nevertheless many fruits do well here, and the apples grown in the mountain regions are superior in flavor and keeping qualities to those produced elsewhere. Fine peaches, plums, and small fruits are grown in most of the mountain valleys, and berries do especially well. The Goodyear Bar district is capable of producing good fruits, but the amount produced exceeds the demand, as we are situated about 60 miles from a desirable market. The fruits that do the best with us are apples, cherries, pears, peaches, and prunes. Blackberries, strawberries, and raspberries are grown to a large extent."

Owing to its remoteness from railroads, its peculiar topographical features, and severe winter climate, Sierra cannot be ranked as a horticultural county, and fruit growing is rather incidental than commercial.

The chief fruits grown in Sierra County are apples, pears, peaches, and white cherries. These are either consumed by the growers or find a market among the neighbors, or in the mining towns in the same or adjoining vicinity. They are marketed usually in their green state, a

very small amount being dried, and none at all canned. An estimate of the output of the different kinds of fruits for 1891 and 1892 is as follows:

	1891. Pounds.	1892. Pounds.
Apples.....	883,750	150,000
Apricots.....	4,500	—
Pears.....	44,000	52,000
Almonds.....	400	—
Walnuts.....	1,500	1,000
Cherries.....	10,000	4,000
Small fruits.....	20,000	18,000
Totals.....	964,150	225,000

Prices for fruit in Sierra County last season and this ranged as follows:

	1891.	1892.
Apples.....	1¼ to 2 cents.	2½ cents.
Peaches.....	4 cents.	4 to 5 cents.
Pears.....	4 cents.	5 cents.
Cherries.....	10 cents.	10 cents.

These prices are received when sold from fruit wagons which run about the county.

The crop in this county this season is almost a total failure. There was a late frost so severe that the leaves were destroyed on the peach trees. It is remarkable that apples and pears escaped as well as they did.

The acreage in fruit in Sierra County is very limited, not exceeding 93 acres, of which about 5 acres were planted during the present season. What fruit is grown there is planted along the rivers near the Mountain House, Goodyear Bar, and Downieville. East of Downieville there are a few trees, but on account of the late frosts fruit raising is made impracticable. A few small fruits only are grown there.

ACREAGE AND VARIETY OF FRUITS IN SIERRA COUNTY.

Variety.	Acres—Bear- ing.
Apple.....	68
Apricot.....	2
Cherry.....	4
Peach.....	5
Pear.....	4
Plum.....	2
Nuts—Almond.....	1
Walnut.....	2
Small fruits.....	5
Total.....	93

SISKIYOU COUNTY.

Siskiyou County is one of the most northerly of the State, being bounded on the north by the Oregon State line; on the west its boundaries are Humboldt and Del Norte Counties, on the east Modoc County, and on the south Trinity and Shasta Counties. It has an area of 6,078 square miles, or 3,800,000 acres, of which 900 square miles are valley land, the greater part of the remainder being mountains.

It contains a large area of farming, mining, desert, swamp, and timber lands. The mining section comprises the western and southern sections; the agricultural district lies chiefly in the central portion of the county, while the grazing lands lie along the Oregon border.

Siskiyou is one of the most rugged of California counties. Here the two great ranges—the Sierra Nevada and the Coast Range—meet, forming the head of the great California valley, known in the north as the Sacramento and in the south as the San Joaquin. The Coast Range, under the local names of the Salmon and Siskiyou Mountains, are in the western part, while the outlying ranges of the Sierra Nevada are in the southeastern part of the county.

There are few regions of country more rugged and mountainous than that lying to the westward of Scott Valley. The whole wide landscape appears to have been formed by some mighty convulsion of the earth, that has thrown up numerous spurs or broken ranges of mountains to the height of from 7,000 to 9,000 feet, and piled them together in strange confusion. During the winter and early spring months they are covered with an immense fall of snow, that renders them a dreary and desolate waste, uninhabitable to man or beast. The snow, however, rapidly disappears under the bright, warm rays of the summer sun, and by the middle of July it is almost entirely gone, and valley, grove, and glen are robed in a mantle of verdure in which are mingled the choicest of wild flowers. Here and there, in the more elevated spots, the snow lingers in great banks throughout the season, but they only serve as refrigerators to lessen the otherwise oppressive heat of summer time.

In the southern portion of Siskiyou, standing at the head of the Sacramento Valley, rises Mount Shasta, the grandest peak in the State, whose famous height has made this portion of California remarkable to her travelers. Mount Shasta is a part of the Coast Range, and is between the two ranges, in the southern part of the county. The mount is 14,450 feet high, being perpetually hooded with snow. The valleys here are from 2,000 to 4,000 feet above the sea-level, the mountains all being among the highest in the United States. The Coast Range is, indeed, at its most picturesque in Siskiyou County, the summits being very unlike the rounded hills surrounding the bay of San Francisco, for they rise, with their rocky formations of granite and slate, into rugged and precipitous peaks. The Sierras also consist in great part, in Siskiyou, of rough and rugged buttes, much of the county thus comprising cañons, gorges, ravines, abrupt mountain walls, precipices, and sudden little valleys. Fortunately for the material interests of the county, this wild country is covered with magnificent forests of redwood, fir, and sugar pine, while the valleys and level lands along the rivers are all extremely fertile.

In the northeastern part of the county lie lava beds, although the "lava beds" proper, of local Indian depredation history, are across the State line to the north. All of the country, in fact, in this northeast-

ern portion of the State, embracing Siskiyou, Modoc, and Lassen Counties, is a high plateau, part of which is called the Central Basin, having beds of lava divided by volcanic peaks. This plateau is from 3,500 to 4,000 feet above sea-level, having steep mountains rising still 10,000 feet higher. This whole table-land would seem to have been formed by some great volcanic overflow of a former period of history.

The principal river is the Klamath, which runs from the Klamath Lakes, at the Oregon boundary, across the country and down through portions of Del Norte and Humboldt Counties, its watershed extending from Mount Shasta and the Trinity range on the east, and the Siskiyou and Coast Range on the west, into which flows the Shasta, Scott, Trinity, and Salmon Rivers on the east side, and numerous small tributaries from both sides. The Sacramento River also rises in the southeastern portion of this county, near the headwaters of the Trinity, Scott, and Shasta Rivers. Most of the McCloud River, a tributary of the Sacramento, is also in the county. At the Oregon boundary, Little Klamath Lake, some 20 miles in length, is mostly in this county, connected by Link River with the Big Klamath Lake in Oregon, which is over 40 miles long.

The largest valleys in the county are the Scott, Big and Little Shasta, and Butte Creek Valleys. Scott Valley is the most fertile of any, and is 25 miles long by from 3 to 5 miles wide. Big Shasta Valley is still larger, but is used most extensively for stock raising, while Little Shasta is one of the richest farming sections of the coast, although not over half as large as those first named. Butte Creek Valley lies east of Little Shasta, and extends along the Oregon line from the high ridges of Klamath River to the famous lava beds. This valley has heretofore been used mainly as a stock range, but settlers are now coming in and taking up farms. Along Cottonwood and Willow Creeks good farms and orchards yield fair returns, and on the mountains surrounding good feed for stock is afforded, while the gulches are excellent places for planting vineyards. Strawberry Valley is south of Big Shasta, at the base of Mount Shasta, and is a splendid section for the production of superior mountain grass for dairying. Squaw Valley, on McCloud River, farther south, is also well adapted for this purpose. The traveler along the main thoroughfares of Little Shasta Valley is favorably impressed with the number of comfortable farm houses and immense grain and hay ranches to be seen on every hand. Little Shasta River supplies an abundance of water for irrigating the whole valley, and, as a result, the latter is beautiful to behold.

The soil of Siskiyou County differs greatly in different portions. In the valleys it consists largely of a deep, black loam, merging to a sharp granitic character in the foothills. The large amount of eruptive rock that covers the northeastern part of the State of California, and which has had its source, to a great extent, from Mounts Lassen and Shasta, extends over the north and east portions of Siskiyou County, covering an area of over thirty townships, known as the lava beds district. Mount Shasta itself is situated on the western boundary of this immense lava flow, near the southern boundary of the county, and rises out of the plain a solitary cone 14,450 feet high, forming a prominent and picturesque landmark; it is entirely volcanic.

Passing through the center of the county, coursing somewhat west of north, with a granitic axis, is the range of Scott Mountains, with Scott

Peak, 7,800 feet high, near to the boundary of Trinity County. This range is flanked by micaceous and other slates, greatly contorted, and traversed by quartz veins, dipping southwest. This granite extends northwest in a belt about 4 miles wide, where the Klamath River crosses it, 9 miles below the mouth of Scott River, and connects with the Siskiyou Mountains in the northwest corner of the county. The Siskiyou Mountains form the divide between Del Norte and this county, and are a rugged, granitic range towering up into separate peaks deeply furrowed. All the streams coming from the north show exclusively granitic boulders, and evidences of heavy denudations are very apparent where the two counties adjoin the Oregon State line.

Along the southwest border the Salmon Mountains show a continuation of the auriferous slate formation coming up from the southeast, dipping to the west, and in this range we find some excellent quartz mining properties.

The climate is more like that of the Middle States, but not so severe in winter; the weather in summer is warm, with cool nights. The snow falls on the mountains to a great depth, and in the valleys from 12 to 30 inches, and remains on the ground from eight to ten weeks. At Fort Jones the mean annual temperature is 48.09°; the highest, 94°; the lowest, 4° below zero. The winter is mild, with but little frost, and the high altitude renders the summer delightful, with cool and pleasant evenings. The average temperature in winter is about 40°, and in summer about 65°. Siskiyou seldom has more than a few inches of snow in the valleys, which melts away in a day or two; but the high mountains are covered with considerable snow, which afford a good fountain for summer benefit, in supplying an abundance of water for mining and agricultural purposes.

Good crops of cereals are sure every season on both high and bottom land, with late spring rains and occasional summer showers, which render irrigation unnecessary during most years. Fruit and vegetables of a temperate climate also grow luxuriantly, and of the finest quality. The mountain meadows and hills also produce the most nutritious grasses for cattle, horses, and sheep, while all the various ravines and gulches are well adapted for gardening and vine growing by reason of their shelter among the hills.

The average precipitation by months at different points in Siskiyou County is shown by the following table, taken from a series of observations covering a period of ten years:

	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Berryvale	3.67	2.00	5.94	3.90	0.30	.00	.00	3.48	1.09	3.48	3.32	5.09
Fort Jones	2.88	4.10	2.77	1.25	1.21	.69	.07	1.16	.14	1.16	2.99	4.99
Scott Valley	4.84	2.97	2.72	1.78	.93	.43	.20	1.25	.40	1.25	3.08	4.84
Yreka	4.38	2.16	1.82	1.53	1.03	.89	.30	1.15	.27	1.15	1.61	2.77

Irrigation on a large scale has heretofore never been attempted in the county, but a movement is on foot to form an irrigation district under the Wright law. Fifty thousand inches of water are to be taken from the upper part of the Klamath River, between Shovel Creek, about 6 miles south of the Oregon boundary, and the town of Keno, in Oregon.

The preliminary survey is being made for an irrigating canal 50 miles

long, 50 feet wide, and 4 feet deep, which will cover 130,000 acres of choice farming lands in Shasta Valley and vicinity. The canal will in all probability be used also for floating down timber from what is said to be the finest belt of sugar and yellow pine in the county. While this movement is in its infancy, it is confidently expected by its promoters to become an accomplished fact within two years. The promoters of this great enterprise are men of large wealth and extensive landholders, whose names give assurance that their enterprise will meet with success.

Horticulture in Siskiyou County is as yet in its infancy. Until the advent of the railroad four years ago, there was no market to which the fruit could be shipped. Apples, pears, peaches, plums, and cherries all do well, and are of a size, quality, and flavor not to be excelled by any other mountain county in the State. Throughout the Scott Valley and Big and Little Shasta Valleys a large acreage of apples was set out last spring. One hundred and forty carloads of apples were shipped out of the county last season by the shipping houses of San Francisco, who made a business of buying up the entire apple crop of the county, generally buying them on the trees and sending experienced hands to pick and pack them for transportation to the forwarding establishments at Yreka and Gazelle, where they were sorted and repacked for shipment. Many of the shipments were made direct to Chicago, New York, and Boston. The Yellow Newtown Pippin, Winesap, Spitzenberg, Northern Spy, and Winter Pearmain, as well as the Baldwin, are the varieties which do the best. They are packed in boxes, each of which contains 45 pounds, loaded into the cars and then shipped to their destination in the East.

All along the Klamath River there are favored spots where are produced the finest varieties of apples, pears, peaches, plums, and cherries, while such small fruits as blackberries, strawberries, raspberries, gooseberries, and currants are produced in great abundance. That the fruit interests of Siskiyou County will vastly increase the wealth of the people is a foregone conclusion.

The chief sections in which orchards are found in Siskiyou are Scott Valley, Little Shasta Valley, Cottonwood, and along the Klamath River. Scott Valley is the best fruit section of the county, but as it is situated about 30 miles from railroad, but little of the output finds its way to market. The varieties in favor there are apples, pears, prunes, cherries, and the more hardy fruits generally. These are generally marketed green, all that are not consumed locally being shipped to San Francisco, Oregon, Washington, Montana, and Idaho. Some of the best apples which find their way to the San Francisco markets are those from Siskiyou County.

One of the oldest orchards in this county is that owned by R. Hayden, and which is called the "Callahan Ranch." It was planted in 1857 by Asa White. The kinds were apples, pears, and peaches, the trees having been shipped from Oregon.

The output of apples from Siskiyou in 1891 was over 8,000 boxes, and prices realized were 2 cents per pound, in boxes. The total output for the present season is not so good as that of last year, but the fruit is more perfect than last season's crop, and would probably bring as much in the market.

The principal planting done during the present year has been in the

vicinity of Scott Valley and the Klamath River. There are about 300 acres in fruit along the Klamath River, of which 100 are composed of young trees.

Since the building of the railroad to Montague, and the completion of a branch line to Yreka, which was completed about five years since, a great impetus has been given to apple growing, and a number of orchards have been planted for commercial purposes. Prior to that period, the only orchards were small patches, planted around residences for family use.

ACREAGE AND VARIETY OF FRUITS IN SISKIYOU COUNTY.

Variety.	Acres in Trees.			
	Bearing.	Non-Bearing.	Total.	Plant of 1892.
Apple	739	473	1,212	103
Apricot	23	97	120	30
Cherry	12	10	22	5
Peach	43	70	113	20
Nectarine	6	2	8	1
Prune	12	18	30	5
Pear	13		13	
Plum	2	1	3	
Quince	7	2	9	1
Nuts—Almond	2	3	5	1
Walnut	1	1	2	
Table grapes	10		10	
Small fruits	25	12	37	8
Totals	895	689	1,584	174

SOLANO COUNTY.

Solano County has a position about midway between the northern and southern extremities of the State of California, and 22 miles north of San Francisco. Its boundaries are mainly natural, having the Rio de Los Putos (commonly called Putah Creek) on the north; the Sacramento River, Suisun and San Pablo Bays, and the straits of Carquinez on the south; the Sacramento River and Yolo County on the east, and San Pablo Bay, the summit divide of the Suscol Hills, and Blue Mountains on the west. It is not exactly square, but about 40 miles from north to south, and averaging almost as much east and west. It contains an area of 828 square miles, or 540,000 acres—100,000 of which are swamp and overflowed lands bordering on the Sacramento River, Suisun and San Pablo Bays. One third of this, perhaps, has undergone the process of reclamation, placing it among the most productive land of the State. These swamp lands border the Sacramento River in the southeasterly part of the county, and Suisun Bay on the south boundary, with San Pablo Bay on the southwest, and are overflowed a few inches in depth at ordinary high tides. In the southeastern portion of the county are the Montezuma Hills, rising from 50 to 300 feet above tidewater, and intersected by narrow ravines or hollows, the watershed having an easterly and southerly trend. The Townsend Hills, in the southwestern portion of the county, are of a similar character. Occupying about twelve sections of land are the Potrero Hills; and in Suisun Township, Robinson Island rises out of the tules, and contains about a quarter section of land. A very large portion of Solano County—at

least two thirds of it—is valley land, the remainder being properly described as foothill. A spur of rolling hills extends from Vacaville nearly north to Putah Creek, averaging 3 miles in width, the slopes and smaller valleys of which have become noted for their early production of fruit and vegetables. On the west of these hills, and parallel to them, lies Pleasant Valley, extending to Putah Creek. The crest of the Vaca Mountains forms the boundary line between Napa and Solano Counties. These mountains reach their highest elevation at Blue Mountain, which is 2,000 feet above ocean-level.

The climatic conditions of Solano are very much like those of her sister counties, although varying much with location. The southern portion, lying on the bay, has many of the climatic features of San Francisco, modified greatly by its remoteness from the Pacific Ocean, while in the northern and eastern portions, situated farther inland, the Sacramento Valley climate is found. The summers here are long and the weather usually warm, sometimes hot. The winters are usually moderate, occasional frosty mornings are seen, and at rare intervals ice will form; but excepting on days when it is raining, the sky is clear and the weather pleasant. The following table of average monthly rainfall, covering a period of ten years, will give an accurate idea of the annual precipitation in Solano County:

	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Benicia	2.92	2.21	2.33	1.48	.37	.17	.01	.01	.05	.54	1.42	3.20
Suisun	4.40	2.83	2.60	1.98	.63	.30	.00	.00	.28	.79	1.59	4.70
South Vallejo	3.04	2.12	2.18	2.02	.57	.23	.00	.00	.09	.70	1.24	2.36
Vacaville	5.40	3.67	3.55	3.49	1.71	.22	.00	.00	.21	.92	2.92	7.35

The soil varies from red gravel to black sandy loam, from barren patches of alkali to rich alluvium; in fact, within the borders of Solano all classes of soil may be found. That of the swamps and overflowed lands is largely composed of decayed vegetable matter, admixed with sedimentary deposits brought down from the uplands by streams. The soil in the greater part of the Sacramento Valley is a light sandy loam, especially adapted to tree growth.

In the trough of the Vaca Valley the soil varies from a sandy to a clayey loam, and sometimes to "adobe." In the heavier soils, and where the subsoil was of a clayey nature, during the winter of 1889-90 many trees, principally peach and apricot, were killed. This was especially the case when they were planted in hollows. Several fruit growers who suffered state that throughout the Vaca Valley fruit trees made both a spring and autumn growth, and that during the winter of 1889-90 the heavy rains set in while the trees were growing, and before the sap had receded from the tops. They are of the opinion that the excessive dilution of the sap occasioned fermentation in the vascular system and the tissues of the plants, resulting in their destruction.

Throughout the hilly land to the east and northeast of Ulattis Creek the soil varies from sandy to clayey, according to the character of the parent formation. Experience has proved that the heavier soils are the best for pears, and the more sandy for peaches and apricots. In wells dug in this district, which may be said to form the western boundary of Vaca Valley, the surface soil varies from 1 to 10 feet in

depth, beneath which sandstone, interstratified with shale, has been penetrated in some instances to the depth of over 200 feet.

Solano County ranks among the leading horticultural counties of California, and during the past ten years has made wonderful strides in this direction. In climate and soil Solano seems eminently qualified for horticultural pursuits, and the earliness and superiority of her fruit products have given her not only a State but national reputation. It is in Solano County that the celebrated Vaca Valley is found, the fruit and vegetables from which ripen and find their way to market so much in advance of most sections of the State. This valley is about 12 miles long and 2 miles wide, and owes its advantage to elevation, location, and surroundings—the surrounding hills protecting it from chilling winds, and the slopes giving to it the full benefit of the spring sunshine, while the deep, rich, fertile soil gives all the required constituents for plant life. Of the 16,000 acres in fruit in this valley, the bulk is devoted to the peach, apricot, and grape. The pear, cherry, and prune are also favorite fruits, while oranges have done well. The income of the valley from fruit annually amounts in round numbers to \$1,000,000. Trains leave daily during the season for the East loaded with fruits.

The extreme earliness with which fruits ripen in the Vaca and Pleasant Valleys is attested by the fact that cherries are shipped regularly by the first of April, and apricots early in May, with all other fruits proportionately early. Vegetables are grown, too, in large quantities, and find a ready sale in the San Francisco market because of their early maturity. The advantage which is thus derived is certainly very great, and the high prices received by the fruit growers in this section attest the esteem in which their products are held by the public, both in California and the East.

The following statement shows the season for shipments of various fruits and prices received for the same last year:

	Date of First Shipment.	Date of Last Shipment.	Opening Price—Per lb.	Closing Price—Per lb.
Cherries.....	April 30.....	June 6.....	20 cents.....	15 cents.
Apricots.....	May 7.....	July 12.....	25 cents.....	3½ cents.
Peaches.....	May 30.....	October 9.....	20 cents.....	4 cents.
Plums.....	June 11.....	August 31.....	2 cents.....	3 cents.
Grapes.....	July 19.....	December 10.....	9 cents.....	4 cents.
Pears.....	June 5.....	September 28.....	10 cents.....	4 cents.

Over the whole county are found numerous orchards of various kinds of fruits, all of which do remarkably well, and amply reward their owners for the labor expended upon them. Within a short distance from the towns of Suisun and Fairfield, between 3,000 and 4,000 acres of valley land have been set to fruit and nut-bearing trees. About fifty people are engaged in fruit growing in Suisun Township, and it is here that the celebrated orchard of A. T. Hatch is located. This comprises 774 acres in almonds, cherries, peaches, pears, plums, prunes, apricots, nectarines, figs, grapes, currants, and gooseberries.

The chief fruit sections of Solano County are Suisun, Vacaville, and Laguna, and the principal varieties of fruits grown there are apricots, peaches, pears, plums, prunes, and table grapes. Vaca Valley is renowned for its early productions of fruits, all varieties ripening there from ten days to three weeks earlier than in most other sections of the

State. On this account the land is very largely devoted to growing fruit, and especially for Eastern and San Francisco markets. A very large proportion of the fruit is shipped green for table use. In addition to that exported, very large quantities of fruit in Solano County are canned and dried.

The export of fruit from Solano last year was 1,034 cars, distributed as follows:

To the East—green fruit.....	514 cars.
To the East—dried fruit.....	261 cars.
To San Francisco—green fruit.....	249 cars.
To San Francisco—dried fruit.....	10 cars.
Dried fruit still on hand.....	50 cars.

The crop for the present season was not so heavy as that of last year, but many young orchards came into bearing, which largely compensated for the shortage. Prices have ruled so much higher in the past year that growers will not lose on account of the above-mentioned shortage. Since June of the present year up to August 3d of the present year, there were shipped from Suisun 164 carloads of fruit, of which 98 cars were shipped directly East, 6 cars going to Liverpool and 60 to San Francisco. Fruit for the Eastern market is packed in refrigerator cars, the pears being put in 40-pound boxes, peaches in 20-pound boxes, cherries in 10-pound boxes, prunes in 20-pound boxes, and grapes in crates of 10 and 20 pounds. Prices paid for fruit in Solano last year and this were as given below:

	1891.	1892.
Pears.....	2½c.	2½c.
Peaches.....	1½ to 2½c.	2 to 2½c.
Apricots.....	1 to 1½c.	1½c.
Plums.....	1 to 1½c.	1½c.
Prunes.....	1½c.	1½c.
Almonds.....	10½ to 15c.	15c.
Cherries (per box).....	92c.	92c.

ACREAGE AND VARIETY OF FRUITS IN SOLANO COUNTY.

Variety.	Acres in Trees.			
	Bearing.	Non-Bearing.	Total.	Plant of 1892.
Apple.....	47	6	53	3
Apricot.....	2,533	1,200	3,733	300
Cherry.....	320	116	436	52
Fig.....	76	175	251	30
Olive.....	50	54	104	21
Peach.....	3,395	1,520	4,915	517
Nectarine.....	103	57	160	12
Prune.....	1,200	1,670	2,870	432
Pear.....	2,050	1,000	3,050	327
Lemon.....		8	8	
Orange.....	15	55	70	12
Nuts—Almond.....	930	540	1,470	160
Walnut.....	13	57	70	15
Raisins.....	1,328		1,328	
Table grapes.....	382		382	
Totals.....	12,442	6,458	18,900	1,831

SONOMA COUNTY.

Sonoma County is bounded on the south by San Pablo Bay and Marin County, on the east by Lake and Napa Counties, on the north by Mendocino County, and on the west by the Pacific Ocean. Its Napa, Mendocino, and Marin boundaries are straight, but its ocean boundary, of more than 65 miles, conforms to the irregularities of the shore. It has an area of 1,500 square miles, or 972,000 acres. On the bay shore it has a frontage of 20 miles.

There is no sameness in the surface of Sonoma County. Variety is a leading characteristic of every township. Valleys, and hills, and mountains appear to have been planned, and their distribution so ordered as to give the best effect. The great central valley, extending entirely across the county from south to north, and having a varying width of from 6 to 15 miles, commands attention by its area and remarkable fertility. The coast range of hills breaks the monotony of the landscape in that direction, while to the southeast Sonoma Mountain rises to the height of 2,400 feet, with Bennett Peak and Mounts Taylor and Hood farther north. Away to the northeast Geyser Peak has an elevation of 3,740 feet, and from its greater height, just beyond, St. Helena looks down upon the whole of Sonoma County. And these hills and mountains are not for ornament alone. High up on their fertile slopes, yes, even upon their very summits, are numbers of the finest homesteads in this county. The area on which rough stone is found to interfere with general farming operations is quite small. Out of the immense area of land in Sonoma County, at least 200,000 acres are valley land, the richest soil known, being a black loam; 200,000 acres are rolling or higher tableland, with an exceedingly rich alluvial brown soil, with considerable sand. This, as a rule, is the best fruit land. We may class 200,000 acres as foothill lands, adapted to many kinds of agricultural and horticultural products and pasturage. At least 100,000 acres of mountain land are adapted to grazing, about 80,000 acres are redwood timber lands of the most magnificent growth to be found anywhere, large quantities of which are being converted into lumber, the amount sawed sometimes aggregating 30,000,000 feet in a single year.

Sonoma Valley, from which the county derives its name, is about 20 miles in length, with an average width of 8 miles. It lies parallel to Petaluma Valley, from which it is separated by a range of mountains.

The streams and watercourses of Sonoma County are numerous, and might, if it were necessary, be utilized for irrigation. On the coast frontage streams of greater or less size flow down from the adjacent hills, at short intervals, to the sea.

Russian River, the largest stream in the county, enters it on the north, flows in a southeasterly direction for 20 miles, turns Fitch Mountain, and finds its way to the lowest depression in the Santa Rosa Basin, from which it breaks through a gap in the Coast Range to the Pacific Ocean.

Russian River gathers the waters from three fifths of the area of the county. Its largest tributary on the northeast is Dry Creek, flowing out of the Coast Range through a splendidly fertile valley 20 miles long and 2 or 3 miles wide, running parallel with and merging into the central valley at the point where Dry Creek delivers its waters to Russian River.

From the northeast, the largest tributaries of the Russian River are

Sulphur Creek, upon which the celebrated Geyser Springs are located, and McDonald Creek, which flows through and out of St. Helena Valley into Russian River. From the mountains on the east, Mark West and Santa Rosa Creeks come down to the plain, and flow for 10 miles across it parallel with each other and 4 miles apart. They empty into the laguna or lake of Santa Rosa, which overflows at high water into Russian River. Copeland Creek comes into the valley from the south, flows northerly, and also empties into Santa Rosa Laguna.

Petaluma and Sonoma Valleys face the bay of San Francisco. They are separated from the Santa Rosa Basin by an almost imperceptible divide, just sufficient to change the watershed from south to north. The streams from these two valleys flow south into navigable estuaries, leading from the bay inland, affording at all times and under all circumstances a cheap, reliable outlet for the product of the soil. All the streams mentioned have tributaries running down from the hills, furnishing to all parts of the county a never-failing supply of pure mountain water.

The mean annual temperature at Santa Rosa is about 57°. In summer there is an occasional hot day, but the mercury seldom rises above 85°. Some winter mornings the thermometer registers the freezing point, but this is exceptional. Rarely does the heat become oppressive in summer or ice form in winter. The difference of averages of temperature for the three warmest and three coldest months of the year is only about 15°. Though nearly all the rains are confined to the winter months, they do not often continue through the season. Usually there are two or three days of steady, downpouring rain at a time without electrical phenomena, followed by a few days and often weeks of perfectly delightful weather without a shower. It is the exception when wet weather continues a week at a time, even in what is called the wet season or season of rains—the winter months. One year with another there is an average of not less than three hundred perfectly fair days per year.

The season of rain may be said to commence in October and end in May, though it sometimes rains in June. It is rare that it rains longer than two or three days at a time, and the intervals between rains vary from a few days to a month or six weeks. As soon as the rain commences in October the grass grows, and by the middle of November the hills and pastures are green. December is usually a stormy month, with now and then a fall of snow in the surrounding hills, but it is rare that the snow falls in the valleys, and it never lies on the ground. The thermometer seldom goes so low as 37° above zero.

Four fifths of the county is susceptible of cultivation, and consists largely of rich alluvium in the valleys, and in the foothills a light sandy soil with a clay subsoil. In the Rincon Valley the soil is deep, of volcanic origin, and is either bright red or ash-colored. The hill soil is intermixed with basalt boulders. It is strange, but true, that the vine and the olive flourish with extraordinary vigor when placed amid or near these boulders, whether they crop out above the surface or lie beneath it. It is said that in many parts of Europe olive trees are mulched with broken rock, stone, or pebbles of any kind, that are available for transportation to the locality required. One of the vineyardists on Rincon Heights advances the theory that the basalt boulders attract and absorb the sun's heat, and when the cool atmosphere after

sunset strikes them a heavy moisture supervenes and produces a natural irrigation.

In the Healdsburg district the soils, which in the valley are a deep, rich loam, and in the foothills a red soil, are exceedingly fertile, and all orchards growing in this district yield fabulously. The soils of all the valleys are largely alluvial, and of three distinct grades, generally sharply defined the one from the other, namely: the deep, rich, bright, sandy loams, including gravelly loams with sand; clayey loams, which are generally inclined to be slippery; and clay loam, black with humus and alkali, very sticky and heavy when wet, shrinking, cracking, and cloddy when dry, locally known as "dobe" soil, or black adobe. The first two are very fine fruit soils, when a little elevated and with good drainage. The first is always choice when it has depth enough. The clayey, gravelly soil is very good with the same conditions. The last is not well adapted to fruit. It often produces fine crops, and is fairly good for apples, pears, prunes, and plums on certain roots. The upland soils are of the cretaceous period. At some time away back in the earth's history, but, geographically speaking, recently, its different strata were broken up and burned, giving the clays and clayey soils the character of brick-dust, and with some red color; in fact, baking the clayey strata into brick-like rock in many places, which gradually decomposes into very rich soil when exposed to the elements. This peculiar soil, often freely mixed with the humus of decaying vegetation, is the brown adobe of the foothills.

The southwest quarter of the county is the rich, red cretaceous lands, covered from 6 inches in some places to an unknown depth in others, with a very fine, rich sandy loam, which, seeming in great part, has been drifted in over the first Coast Range by the strong westerly winds. This is a wonderfully fine fruit soil, adapted to all fruits which the climate suits.

The rainfall in Sonoma County is much heavier than in many other parts of the State. Precipitation is not the same throughout the county. More rain falls in the northern territory than in the middle and southern sections. Most years the precipitation at Cloverdale, the most northern town, is 50 per cent greater than at Santa Rosa, and as much as 80 inches of rainfall are recorded there. The story of the rainfall at Santa Rosa, since the early settlement, is told by the following table:

	Inches.		Inches.
1853-4	29	1873-4	29.54
1854-5	30	1874-5	23.30
1855-6	25	1875-6	34.56
1856-7	25	1876-7	15.25
1857-8	23	1877-8	44.65
1858-9	34.50	1878-9	31.56
1859-60	21	1879-80	31.16
1860-1	17	1880-1	34.22
1861-2	46	1881-2	17.38
1862-3	17	1882-3	24.45
1863-4	12	1883-4	20.40
1864-5	26	1884-5	15.32
1865-6	28	1885-6	37.24
1866-7	40	1886-7	19.46
1867-8	50	1887-8	20.97
1868-9	26	1888-9	25.99
1869-70	25	1889-90	55.96
1870-1	17	1890-1	29.08
1871-2	40	1891	10.55
1872-3	21.56		

There has never been a dry season in Santa Rosa Valley. In nearly forty years of cultivation there has not been a crop failure. Of course some seasons have been more prolific than others, but very fair returns have always been secured.

Sonoma is one of the fruit counties of California. While a large portion of her area has been devoted to the grape—and in the manufacture of wine she holds a front rank among the counties—all other varieties of fruit have been cultivated to a greater or less extent, and in most instances, when intelligent care has been bestowed upon them, have well rewarded that care.

On Rincon Heights, just back of Santa Rosa, a large number of olive trees were planted on a high, rocky soil, which are now growing beautifully, some already bearing. This was the first attempt at olive cultivation near the city, and has proved the soil and climate to be admirably adapted to this important industry.

The peach, prune, apricot, pear, plum, apple, and cherry thrive in all parts of Sonoma County. The Bartlett pear, so much sought in Eastern markets, grows in its highest perfection there, many horticulturists making it a specialty; it is, in fact, one of Sonoma's standard industries. The demand is growing, and its production is very profitable. The orange, lemon, and lime grow in the warm belt, which encircles the valleys, without irrigation. In the open valley there is danger of injury by frost; but on good loam soils, from 50 to 400 feet above the valley, citrus trees thrive and bear fruit.

The fig grows everywhere, except on the lower lands. Two crops are produced, and all varieties thrive. The palm, all varieties, the dracaena, fan-leaf, and date, grow everywhere in the district, with but the ordinary care given common trees.

Currants, gooseberries, blackberries, raspberries, strawberries, and almost everything else grow with great luxuriance, in prodigious quantities and of enormous size, without irrigation. Grapes will yield from 2 to 7 tons to the acre, according to the variety and soil. As a rule the high-grade wine grapes are light bearers, from 2 to 3 tons for the Cabernet Sauvignon, worth \$30 per ton. The Mission grape will yield from 5 to 10 tons to the acre. Pears will realize \$200 per acre for shipment to the East. Prunes, at present prices, will yield from \$200 to \$300 per acre. The peach trees bear at three years old, and will yield 50 pounds to the tree. Plums succeed in all situations, in all varieties, and bear heavy crops.

The following report from the Santa Rosa "Republican" gives a graphic account of the horticultural adaptabilities of Sonoma County:

"Coastward the summer climate is rather cool for nearly all fruits, though fine for some varieties of apples, pears, plums, and small fruits. In places with a southeastern exposure, completely sheltered from summer ocean winds, nearly all fruits do finely quite near the coast. Eight to 12 miles from the coast are climates and soils for winter apples and most other fruits, according to exposure. The summer climate of this region is grandly fine when sheltered in part from the summer ocean winds, and is also very mild in winter.

"Passing to the north the Coast Range becomes higher, and is generally covered on the east and north slopes with those two grand and towering trees—the redwood and Douglas spruce—with a sub-growth of oaks, and many other trees and shrubs. These high hills and their forest cover-

ing shelter the country to the east from the cool summer winds in part, which gives the finest climate, for peaches and nearly all other kinds of fruits, to be found anywhere. This, coupled with a soil of nearly absolute perfection in every particular, goes to make up the great Sebastopol and Forestville fruit region.

"Then, on we go, up the west side of the Russian River, with the finest of rich, deep, sandy, and gravelly loams in the valley, and the choice red, mellow clays on the foothills. The climate has become warmer in summer and very little cooler in winter as we proceed northward. Fruits ripen earlier there and are indeed choice. The people up there are very proud of their country for fruit, and no people have any better right to be proud.

"From Healdsburg stretches due north Dry Creek Valley, with rich loams and a hot summer climate—at times a trifle too hot for comfort. Still people there make no complaint, and produce a large amount of fruit. Healdsburg is noted for its plums, prunes, Bartlett pears, choice peaches, and small fruits, with quite a sprinkling of oranges. Then, on up the Russian River Valley, with fine fruitful valleys stretching into the mountains, with some gently elevated slopes, until we reach Cloverdale, where everything in the horticultural and climatic line seems to come to a head. Whenever they have a clear day at Cloverdale, summer or winter, it is warm, but with the nights always cool; the people like their climate. Their fruits certainly like it, and grow finely. Here we find oranges planted by the acre and doing splendidly, with the fruit ripening early, and with luscious sweetness and flavor.

"Then, back south among the hills and mountains to the east we find tens of thousands of acres of warm red and yellow clays. There peaches, plums, and prunes are not so large and juicy as those grown in the valley loams and the warm sands of the hills, yet they are sweet and rich, and specially valuable for drying.

"The wine grapes of this region are the acme of perfection, and the olive flourishes like a green bay tree. Part of this region is steep, rough, and stony, yet there are many fine slopes and table-lands—splendid for orchards and vineyards. It seems to have been perfectly designed for olives and wine, in many parts a rough, wild country with many natural curiosities, mineral and hot springs, mines, building stone, petrified forest—everything but little level land and no poor soil, for where there is any soil at all it is rich.

"If we keep on south we will gradually drop into the Sonoma Valley through Los Guillicos, at Glen Ellen. This vicinity and adjacent foothills have a vast amount of fine fruit soils. The climate is fine in every way for all life. It is the oldest settled point in the county, both by Spaniards and Americans. The facilities for fruit growing are superb, two railroads traversing the valley from end to end, with navigable tidewater at the mouth of the valley. A few years ago much of the valley was in magnificent wine grapes. The phylloxera destroyed many vineyards, giving a cruel blow to the prosperity of the people. Many of the vineyards are being reestablished on resistant roots, or are being planted to fruit trees. Then, over the hills west, 8 miles through a country nearly as good as the best, to Petaluma, around which snug city are many fine orchards, and very profitable ones. Here, near Petaluma, it is claimed were planted the first orchards on the dry hills that proved a success without irrigation, a most valu-

able lesson to the whole coast country. The venerable J. W. Cassidy was a pioneer in this dry-land planting, and his fine 20-acre orchard, on what a few years ago were called worthless sandhills, has proved such a success that those sandhills are now worth \$200 per acre.

"We have now left the great northwestern portion of the county, lying between Russian River and the ocean, comprising several Government townships, a jumble of hills, though much of the territory is smooth and not rocky, with a fine, rich, clayey soil, climate superb, except where directly facing the ocean, and even that suits many people best of all. It is a rugged country, but capable of supporting quite a dense population in health, comfort, and plenty. There is hardly an acre of it that would not grow as much value in the right fruits as in any portion of the State. It is adapted to olives, apples, pears, plums, prunes, and choice table and wine grapes. The hills are no steeper than those on which are the mass of the finest vineyards and orchards of Europe, and like them should be cultivated by hand labor. It will be a glorious country some day. It is now used by stockmen and sportsmen.

"We have now skimmed lightly over the entire county, and there is little use to particularize further, so far as fruits are concerned. There is scarcely a plowable plot of land in the county, great or small, that a rustling, intelligent man cannot cultivate in fruits of the great commercial species adapted to the soil and climate without success, if he plants the right varieties and cares for them properly.

"The homely old apple, the king of fruits, can be made to pay as large, sure, and permanent income per acre for a term of years as any other fruit in any part of the State. The Sonoma County orchardist has no cause to fear competition with the fruits of any other district. If he is not a taker of blue ribbons when competing with fruits grown anywhere, he is the party in fault, and not the county, her soils, or climate. He may let citizens of other portions of the Golden State occupy the top round of the ladder beside him, but representatives of no other State or country can gain that round in fair competition.

"Our modes of orcharding are not perfect, but we are learning year by year, and most of us are willing to learn. We have had many serious and, to us, entirely new difficulties to meet in the past few years. The many have met them manfully, and conquered. The few have been whipped, and dropped out. All must expect future troubles. Yet if we meet them with intelligence, industry, and patience, we shall still hold the fort.

"Two of the largest canneries of the State are located at Santa Rosa. The Hunt Bros.' Fruit Packing Company commenced business in 1887, and was incorporated in 1890. The officers are: J. H. Hunt, President; W. C. Hunt, Secretary; Allen A. Curtis, Vice-President; L. W. Burris, Treasurer. The plant includes a cannery 120 by 180 feet, and a drier 66 by 80 feet, and they are located near the Donahue depot. The total cost of the plant was over \$30,000, and it contains all the best machinery necessary for canning and drying fruit and preparing it for shipment to market. Something of the amount of business done by this company can be seen from the fact that 4,500,000 pounds of fruit were used in 1890, and there was paid out the neat sum of \$225,000, \$35,000 of which went to the 500 hands employed in and about the vast establishment, and \$100,000 for fruit alone. In 1890 the pack amounted to 20,000 cases of

canned goods and 30,000 cases of dried fruit. The amount of fruit used in 1891 was 6,300,000 pounds, or over 3,000 tons. The amount of money used in the same year reached the figure of \$200,000. There were 550 hands employed, and 50,000 cases of canned goods were packed; 20 cars of dried prunes and 50 cars of dried grapes were handled, and the amount of money paid out for labor in 1891 was \$30,000, while that paid out for fruit was \$75,000. The company ships its goods to all the big markets of the United States, London, and Australia.

"The Santa Rosa Packing Company was established in 1881, J. Black being the first manager. In 1884 the pack was 6,000 cases, while the first year's pack was 5,000 cases. In 1885 were packed 10,000 cases; in 1887, 25,663; in 1888, 36,380; 1889, 14,490; 1890, 62,775. Last September Mr. Perry, the manager at that time, estimated that since 1881 \$150,000 had been paid out for labor and \$350,000 for material, about 70 per cent of which went to Sonoma County people. In 1890 \$200,000 were paid out for labor, fruit, and improvements by this company, \$800 being for cartage, all of which cartage fees went to Santa Rosa men. At that time Mr. Perry estimated that the canneries of Sonoma County were paying out between \$2,500 and \$3,000 per day for labor, and it all went to those most in need of it.

"The Petaluma Fruit Packing Company is another institution that contributes very materially to the prosperity of Petaluma and Sonoma County. It is located below the drawbridge, and can be reached by water and by rail. M. P. Ashby is the Superintendent. It packed last season about 48,307 cases of fruit, there being of peaches, 12,000; plums, 9,500; pears, 7,000; apricots, 11,500. There were 350 hands employed, and the payroll aggregated about \$28,000, while the amount paid for fruit was fully \$48,000.

"The Sonoma Packing Company is a new concern, having been established by parties from Boston, Mass. G. O. Sanborn is the Superintendent, and the institution has the reputation of turning out a very superior article of pickles, catsups, Chile sauce, jar honey, etc.

"Petaluma has a large fruit drier, the property of C. W. Adamson, who has lately added a distillery, and is now working over the pomace into brandy. Mr. Adamson has put up large quantities of fruit this season, and will do even more next year. His plant is just across the creek from the cannery.

"The Russian River Packing Company has one of the best plants in the county. It was built last season, being completed in time to do but a limited amount of business. Its Superintendent is Dr. Biddell. Having been built since the other canning establishments in the county, it possesses all their best qualities and some qualities they have not, among them being the rotary soldering machine. The Russian River Packing Company employed about 225 hands last year, but when the cannery is working in full blast about 400 people will be laboring there. The rooms are all well lighted and ventilated, there are convenient cloak-rooms, and, altogether, great pains have been taken to provide for the health and comfort of the employes.

"The Star Dried Fruit Company, in which the proprietors of the Russian River Packing Company are interested, employed between 50 and 75 hands when running in full blast, and already over 1,000,000 pounds

of fruit have been shipped away from their warehouse, 800,000 pounds of which were prunes.

"The Van Alen Packing Company is an extensive institution, and was established in 1887. It is located on the north side of the river, and not far from the railroad bridge. Between 20,000 and 25,000 cases of fruit were packed at the Van Alen cannery last season, about three fourths of which were peaches. About 3,000 cases of cherries, 1,500 of pears, 2,500 of plums, 4,000 of apricots, and 200 cases of berries were put up. A large drier has been erected near the cannery, and about 35 tons of prunes were dried in this, its first season. This company paid out \$25,000 for fruit and about \$16,000 for labor last year.

"L. H. Stewart is Superintendent of the Magnolia cannery, T. S. Merchant, proprietor. The Magnolia was established in 1888. It began its season's work in May, the first fruit handled being cherries. Of these, 3,000 cases were put up; of blackberries, 1,600 cases; standard fruits, 22,000; total, including jellies and jams, about 45,000 pounds. Between 400 and 500 hands were employed, and over \$50,000 were paid out for fruits alone. Fifteen different kinds of jellies and twelve different kinds of jam, or about 6,000 cases, were put up this year.

"The viticultural interest of Healdsburg is very extensive, there being more than half a dozen wineries, some of them having distilleries attached. Over 4,000 tons of grapes were produced in the Healdsburg district last year, and of that crop fully one fourth went to the great winery of Kohler & Frohling, near Windsor. Over 1,000 tons of grapes were dried in this district the past year. About 100,000 gallons of wine were made in the district—10,000 by the Funston winery, 20,000 by Paxton & Gobbi, 15,000 by Davidson, and 10,000 by Weiderhold. Simi's wine cellars have a capacity of 600,000 gallons, but their product during the year we have not learned. There are a number of wineries near Healdsburg; all are doing a big business, but lack of space prevents us from mentioning it here. Nearly all the Healdsburg wine has been sent to San Francisco, while large quantities of grapes from the district have been sent to the must condenser, to Hunt Bros., and to others. It is estimated that about 40,000 gallons of brandy were produced in this district last year."

The chief fruit sections of Sonoma County are Healdsburg, Cloverdale, Sebastopol, Santa Rosa, Green Valley, Petaluma, and Sonoma, and the principal fruits are cherries, peaches, pears, and prunes. These are shipped both green and dried. Besides these, deciduous fruits do well. The Japanese chestnut bears finely, and berries of all kinds are a sure crop.

Prices for fruit in Sonoma for the past two years ruled as follows:

	1891.	1892.
Pears	1½ to 1¾ cents.	1½ to 2 cents.
Peaches	1½ cents.	1½ to 2 cents.
Cherries	6½ to 7 cents.	5 to 7 cents.
Apricots	1½ cents.	1½ cents.
Plums	1½ cents.	1 to 1½ cents.
Prunes	1½ cents.	2 to 2½ cents.
Apples		

The yield for the present season was very light, peaches not averaging over one half crop, pears and apples one half, cherries one fourth, and prunes one half to two thirds of a crop.

ACREAGE AND VARIETY OF FRUITS IN SONOMA COUNTY.

Variety.	Acres in Trees.			
	Bearing.	Non-Bearing.	Total.	Plant of 1892.
Apple	3,100	1,021	4,121	220
Apricot	129	100	229	37
Cherry	150	167	317	106
Fig	30	21	51	19
Olive	156	451	607	132
Peach	1,707	800	2,507	238
Prune	1,018	1,581	2,599	527
Pear	984	423	1,407	117
Plum	12	8	20	2
Lemon	1	1	2	
Nuts—Almond	37	33	70	16
Walnut	38	42	80	12
Table grapes	427		427	
Small fruits	200		200	
Totals	7,989	4,648	12,637	1,426

STANISLAUS COUNTY.

Stanislaus County is one of the San Joaquin Valley group, and is bounded north by San Joaquin and Calaveras, east by Calaveras and Tuolumne, south by Merced, and west by Santa Clara. It extends across the entire width of the San Joaquin Valley, reaching from the summit of the Coast Range on the west well into the foothills of the Sierra Nevada on the east, and includes within her limits an area of 1,500 square miles, or 924,800 acres. Both its eastern and western borders present on the map greater breadth than the center. The San Joaquin River, a navigable stream for eight months in the year, flows across the county some miles west of the estimated geographical center. From that stream diverge two tributaries, or arms, the Stanislaus and Tuolumne, both leading eastward to the Sierra, and both of which are navigable for from three to six months in the year. There are also several other streams of more or less importance throughout the county.

The greater part of the county is an almost level plain, stretching away in every direction until it merges into the foothill and mountain region on the east and west.

The climate of Stanislaus does not vary materially from that of the other counties in the San Joaquin Valley. The summer months are warm, and in July and August frequent hot days occur, when the mercury will range to 100° and over, sometimes reaching 110° to 112°. The autumn months are very pleasant and the spring months perfect. During the winter, which extends from November to April, the weather, when no rain is falling, is all that could be desired—pleasant, balmy, and invigorating. Occasionally a light frost will occur, but seldom of sufficient severity to do any damage except to the tenderest vegetation.

The average rainfall of Stanislaus is under the general average of the State, the precipitation at Modesto being about 9½ inches. The fol-

lowing table shows the average monthly precipitation at the principal points in the county:

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Grayson	2.21	1.77	1.62	1.22	.44	.17	.00	.00	.01	.47	1.22	2.70
Hills Ferry	1.17	2.11	2.45	1.47	1.04	.41	.00	.00	.19	.32	.56	1.97
La Grange	2.86	2.75	2.55	1.48	.52	.08	.00	.00	.30	.93	1.98	2.22
Modesto	1.84	1.31	1.27	1.03	.40	.13	.01	.00	.11	.42	1.25	1.63
Oakdale	1.51	.53	3.41	1.56	.25	.05	.00	.00	.00	.30	.73	1.10
Turlock	1.05	1.70	1.62	1.54	.62	.38	.00	.00	.03	.64	.80	.97

On the eastern side of the county the soil is of a sandy nature, merging into loam as the foothills are approached. The prevailing soil on the west side is a rich loam of an indefinite depth, and which under water is wonderfully fertile. The San Joaquin River divides the county a little west of its center line, and this is bordered by a belt of tule land from 1 to 2 miles in width. The lands immediately adjoining this on the east side, for a width of 1 to 5 miles, are principally adobe. The lowlands adjoining the Tuolumne River are very sandy, while those along the Stanislaus are a dark, firm loam. In the central part of the county the soil is of a sandy character, especially to the south of the Tuolumne River, changing northward and westward to grayish and blackish loams. Some alkali patches are found in the lower lands, but these are not very extensive.

Two of the finest and most extensive systems of irrigation in the State are under way in this county, both of which are being carried on under the operation of the Wright Act. These are the Modesto District, covering 81,000 acres, and the Turlock District, with 176,000 acres.

The petition for the formation of Modesto District was presented to the Board of Supervisors May 11, 1887, and was considered by them from the date of its presentation to June 7, 1887. There was considerable opposition made to the organization of the district, on the ground that the opponents did not desire irrigation by any plan. However, the petition was granted with certain modifications. The election for the district was ordered on June 7, 1887, and was held on July 9, 1887. The number of votes cast was 856—700 for and 156 against.

The following Directors were elected: J. W. Davison, E. H. Catlin, R. McHenry, A. C. Carver, W. H. Finley. Robert McHenry was elected President; J. W. Davison, Secretary; I. Perkins, Treasurer.

An election for bonds was ordered on November 18, 1887, and it was proposed to issue bonds for \$800,000. The election was held on December 4, 1887, and resulted: 439 ayes to 66 noes. Bonds to the amount of \$800,000 were therefore issued and advertised January 7, 1889, and bonds to the amount of \$142,000 have been sold.

A weir dam is being constructed across the Tuolumne River, near La Grange, at a point about 1,450 feet below the county boundary line, between Stanislaus and Tuolumne Counties. This dam is curved in form and built of rubble masonry and concrete. It will be, when finished, 129 feet high, 20 feet wide, and 320 feet long at the crest, and 90 feet wide and 60 feet long at the base. It will contain about 32,000 cubic yards of rubble masonry, and is to be built by and for the joint use of the Modesto and Turlock Irrigation Districts. This will be the highest weir dam in the United States, having an overflow of over 160,000 cubic

feet per second at extreme high flood. The plans for this dam were approved by Colonel Mendell, United States Government Engineer for the Pacific Coast. The work is estimated to cost \$425,000. The dam is now finished to a height of 60 feet, and 12 miles of canal are completed. By the next irrigating season there will be 20 miles of canal, and the dam will be over 90 feet high.

The first 2 miles of the canal follows the steep bluffs of the river, in places nearly perpendicular. The formation is slate and some little hard rock. The plan is to have an outside retaining wall of rock, a puddle wall, and inside riprap. The larger cañons will be crossed with flumes on wooden trestles. The grade along this portion of the canal is 1.5 feet to the 1,000 feet, the bottom width of canal 16 feet, with a slope of a quarter to one, and the depth of water 7 feet. The canal is calculated to carry 640 cubic feet of water per second, with a velocity of 4.9 feet. The grades and velocity on the flumes are greater, and the width of same on bottom will be 10 feet, with 7 feet depth of water. After the first 2 miles the canal leaves the steep slopes of the river bank and follows the plateaus and benches, where the only difficult work will be the construction of a tunnel about 1,200 feet in length and the crossing of deep cañons. The grade on this portion of the canal is 1 foot to the mile; width of canal on bottom, 28 feet, with a slope of two to one; 7 feet depth of water; velocity, 2.43.

The Turlock District enjoys the distinction of having been the first one organized under the provisions of the Wright Act. The petition for the organization of the Turlock District was presented to the Board of Supervisors on April 11, 1887, the same embracing about 30,000 acres of land in Merced County. The total area of the district is about 176,210 acres, the greater portion being in Stanislaus County. The Supervisors considered the petition from April 11 to April 28, 1887. No opposition worthy of note was made, except as to particular boundaries, therefore the petition was granted, and an election was ordered April 23, 1887, with the slight changes necessary in the proposed boundaries. The election was ordered to be held on April 28, 1887, and the district was organized by the Board of Supervisors pursuant to the election on June 16, 1887. The Directors elected were: E. V. Cogswell, R. M. Williams, E. B. Clark, W. L. Fulworth, and J. P. Dunn.

The first meeting was held and organization effected on June 5, 1887, and E. B. Clark was elected President, R. M. Williams Secretary, and C. N. Whitmore Treasurer. The only action taken was the selection of officers and some routine business transacted. Preliminary plans and estimates were ordered on June 15, 1887, and were completed and adopted September 15, 1887, George E. Manuel being the civil engineer who made the same.

The area of the Turlock District is nearly 177,000 acres. The capacity of the canal is 1,500 cubic feet per second. This will give 1 cubic foot to each 118 acres for the whole district. Work on the main canal was started in March, 1890. There are nine drops in this canal, varying from 3½ to 11 feet. There are four tunnels, aggregating in length 1,500 feet. The canal varies in width from 20 to 40 feet, and has an average depth of 7 feet. As indicating the work on the canal, and its cost, Eugene H. Barton, Chief Engineer, furnishes the following report of the work completed in June, 1891:

Section 1, Main Canal.—Sub-section 1 was composed entirely of slate

and was very expensive to cut, costing \$5 35 per running foot, requiring also retaining, riprap, and puddle walls; total cost, \$21,490 25. Sub-section 2 was a thorough cut through cemented gravel, clay, and hardpan, containing 90,000 cubic yards; extreme depth, 56 feet; total cost, \$25,388 33. Sub-section 3 was a thorough cut through cemented gravel, hardpan, sandy soil, and basaltic rock; extreme depth, 27 feet; total cost, \$14,851 11. Sub-section 4 was scraper work; sandy loam, containing 53,000 cubic yards; total cost, \$8,762 48. Sub-section 5 is tunnels 1, 2, and 3; total length, 1,000 feet, containing 9,560 cubic yards, the approaches to the tunnels containing 8,000 cubic yards; total cost, \$14,218 98.

Section 2, Main Canal.—Sub-section 1 was a thorough cut through cemented gravel, hardpan, and soil. This cut was taken out by the hydraulic process, water having been taken from the La Grange Ditch and the Hydraulic Mining Company's reservoir, 4 miles distant, the district constructing about 7,000 feet of ditch and inverted siphons to deliver the water at the pressure-box, giving a 100-foot pressure to the grade line of the cut. A flume was constructed with 2 feet fall to the 100, 3,000 feet long, to carry material to the waste ground; containing 242,000 cubic yards; entire cost, \$78,554 89. Sub-section 2 was light scraper work, including thorough cut; extreme depth, 18 feet, containing 208,000 cubic yards; total cost, \$44,696 94. Sub-section 3 was light scraper work, containing 267,854 cubic yards; total cost, \$45,259 03. Sub-section 4 was light scraper work and thorough cut; thorough cut contained 70,000 cubic yards of hardpan; extreme depth, 30 feet. The sub-section contained altogether 218,531 cubic yards; total cost, \$18,651 90. Sub-section 5 was scraper work and heavy cutting, containing 172,000 cubic yards; total cost, \$14,878 32.

There have thus far been moved 1,282,000 cubic yards to build main canal.

At the end of the main canal five lateral canals are built, distributing water through the entire district. Smaller canals are built from the lateral canals to deliver water to each section. Eight hundred thousand dollars have been expended on construction, and incidental expenses, buying rights of way, and cost of dam will bring the cost of the entire system up to \$1,100,000. A weir dam has been constructed across the Tuolumne River near La Grange, at a point about 1,450 feet below the boundary line between Stanislaus and Tuolumne Counties. The dam is curved in form and of rubble masonry and concrete. It is 105 feet high, 20 feet wide, and 320 feet long at the crest, and 90 feet wide and 60 feet long at the base, containing about 32,000 cubic yards of rubble masonry. This dam was built by and for the joint use of the Turlock Irrigation District and the Modesto Irrigation District. This is the highest weir dam in the United States, having an overflow of over 160,000 cubic feet per second at extreme high flood.

The plans for this dam were approved by Colonel Mendell, United States Government Engineer for the Pacific Coast. The structure cost \$325,000.

IRRIGATION WORKS IN STANISLAUS COUNTY.

Name.	Miles.	Value.
San Joaquin and Kings River Canal.....	11½	\$25,000 00
La Grange Ditch—mining.....	4	6,000 00
San Joaquin Ditch—irrigating.....	5	5,000 00
Knights Ferry Water Company—irrigating.....		600 00
Totals	20½	\$36,600 00

Stanislaus County is eminently adapted by location, climate, and soil for horticulture, and nearly all varieties of fruit will grow and do well there. The larger part of her area has heretofore been devoted to cereal growing, but of late years more attention has been given to fruit, and the extent of land planted to orchards has been largely increased by means of the irrigation works which have been inaugurated in the past few years. At Knights Ferry, K. Vogt has a fine orchard of between 500 and 1,000 orange trees, which yield excellent fruit in abundance. At Turlock, Lusk & Co. have a large tract of land which they will plant to fruit.

Grapes arrive at a high state of perfection in Stanislaus County. Much of the soil is peculiarly adapted to the growth of the vine. There is there the same quality of soil that produces the raisin grape in such quality and extent that Fresno has been made famous thereby. The wine grapes also attain a superior degree of richness in color and flavor.

In all parts of the county grapes are grown successfully, and there is a good foundation for the belief that with the advent of irrigation the acreage devoted to viticultural purposes will be doubled and quadrupled.

Nearly every known variety of fruit reaches a state bordering on perfection in Stanislaus County. Peaches, pears, nectarines, apricots, plums, apples, figs, walnuts, almonds, etc., are common products there, and in some parts of the county it is claimed that apples superior in size, flavor, and quality are raised. Small fruits and berries thrive luxuriantly in most parts of the county, while watermelons of mammoth proportions and delicious, tempting flavor mature on the plains without irrigation.

At Murphys very fine apples are grown, excelling there all other fruits, the favorite varieties being the Baldwin, Alexander, Winesap, Red Astrachan, Yellow Bellflower, Rhode Island Greening, Spitzenberg, Red Cheek Pippin, Swaar, White Winter Pearmain, Porter, Hubbardston's Nonesuch.

The leading fruits about Burson are peaches, almonds, figs, grapes, and berries. West Point is a splendid district for apples; they keep splendidly, and cannot be beat for fine flavor and keeping qualities. They are mostly sent to Stockton for market. They net there about 1½ cents per pound in bulk or in boxes. With a railroad this could be made a splendid paying business, equal to an orange grove.

The principal fruit sections of this county are Knights Ferry, Oakdale, Modesto, and Riverside, and peaches, apricots, and nectarines are the chief fruits grown for market. At Knights Ferry there are several extensive orange orchards, and one, belonging to Kaspar Vogt, has a well-earned reputation all over Northern California for the excellence

and size of the fruit grown. A large number of fig trees are also grown over the greater part of Stanislaus County. Nectarines and almonds also do well there. Stanislaus is one of the oldest fruit-growing counties in the State, taking its start as a mining county in the days of the gold excitement; a number of family orchards were planted at that early period, and one at Knights Ferry, now owned by Mr. Collins, consisting of peaches, apples, pears, and other deciduous fruits, was planted as early as 1856. The Pentaland Bros. also planted an orchard in 1856, which was washed out by a flood at a later date and destroyed. Oranges were marketed from Vogt's place as early as 1874. One of the largest orchards in the county of Stanislaus is that owned by Mrs. Stephen Rogers, at Modesto. This is known as the "Paradise Orchard," and is located 5 miles southwest of the town, on the Tuolumne River bottom. All varieties of fruits and vegetables are grown there without the aid of irrigation. One hundred and ten acres of this were set to oranges twelve years ago, and the trees are now in full bearing. A large portion of the products of this orchard is shipped directly East. There is a small cannery in connection with this orchard, and a car of dried fruit was sent to Eleanor last year.

The fruit crop of the present season is reported light, peaches and prunes falling below 50 per cent. The crop of English walnuts and almonds is reported as being good.

A very large portion of the fruit produced in Stanislaus County finds a ready market in the East, and is shipped both dried and green. There has been a very large area of new land set to fruit during the present season, most of which belongs to the citrus family.

ACREAGE AND VARIETY OF FRUITS IN STANISLAUS COUNTY.

Variety.	Acres in Trees.			
	Bearing.	Non-Bearing.	Total.	Plant of 1892.
Apple.....	101	81	182	20
Apricot.....	122	77	199	18
Cherry.....	13	14	32	5
Fig.....	57	86	143	47
Olive.....		22	22	8
Peach.....	180	160	340	72
Nectarine.....		7	7	1
Prune.....	5	43	48	17
Pear.....	94	84	178	15
Lemon.....		4	4	
Orange.....	15	97	112	58
Nuts—Almond.....	11	25	36	10
Walnut.....		3	3	
Totals.....	603	703	1,306	271

SUTTER COUNTY.

Sutter County is located in the Sacramento Valley, midway between the Sierra Nevada on the east and the Coast Range on the west. It is bounded on the west by the Sacramento River, which separates Sutter from Colusa and Yolo Counties; on the south by Sacramento County; on the east by Placer, Nevada, and Yuba Counties, and on the north by

Butte County. The outline of the county is very irregular, and the area is 610 square miles, or 391,000 acres.

Sutter is the only county in the State which lies wholly within either of the great valleys, and, with the exception of the buttes, which rise abruptly from the valley in the northern part of the county, it is simply an immense plain. These buttes, now commonly known as Sutter Buttes, form the most conspicuous and notable topographical feature of the Sacramento Valley. They rise abruptly from the plain to a height of nearly 2,000 feet, occupy an area of 4 by 12 miles, and can be seen for a distance of 100 miles from the north and south. In these mountains there are numerous little coves which are tillable, and the hill lands are found excellent for grazing purposes. About 125,000 acres of land are tule or overflowed land. During high water the Sacramento River sends a part of its stream through Butte Slough, which, after flowing a few miles between well-defined banks, spreads out and forms the Tule Basin. The depth of water in this basin is from 2 to 10 feet. The water remains there until May or June, when, the river having receded, the basin is drained of its waters at the lower end, near the junction of the Feather and Sacramento Rivers. Before the water falls the tules, a vegetable growth from which the basin takes its name, spring up and grow very rapidly. The tules are similar to the rushes in the Eastern swamps, growing as high as 20 feet, and close together. This immense vegetable growth dies or is burned down every fall, and its remains mix with the sand deposited by the water when standing in the basin. This, going on for ages, has formed a soil of incredible fertility, but now rendered almost worthless by water. The northern end of these tule lands has been redeemed, and now constitutes a levee district of 10,120 acres, and is most valuable.

Situated in the heart of the Sacramento Valley, Sutter has the climate peculiar to that valley, and all that has been said of the surrounding counties in this matter applies equally to her. Extremes of heat and cold are unknown, yet there are occasional frosty mornings in the winter months, and days that are sometimes uncomfortably hot in the summer, when the mercury will reach above the 100° limit. These extremes, however, are of rare occurrence. The range of temperature between the lowest in winter and the highest in summer will be from 20° for the former to 110° for the latter. These are the extremes, the average annual temperature being about 60°.

The prevailing winds of the Sacramento Valley are from the south. They are cool, moist sea breezes, tempered by their overland journey. This breeze blows on an average two hundred and fifty days in the year. North winds are of less frequent occurrence and far less pleasant in their effects. These winds sometimes cause great damage to the growing crop, sapping the moisture from the grain and causing the kernels to shrink and lose in weight and quality, or coming when the grain has ripened they thrash out the matured grain, entailing great loss to the farmers.

The rainfall is usually ample, and dry seasons exceptional. The average fall from a record of ten years gives 19.318 inches as the annual precipitation, which is above the average of most other portions of the State.

The lands on the Sacramento River are highly productive, and largely under cultivation. The lands of the county are mostly dark loams, with some red, gravelly clays on the higher elevations. Stiff adobe tracts

extend both north and south for some distance from the foot of the buttes, and are found also in the lower grounds south of Yuba City and along the swamp lands. The alluvial lands, which are extensive, are suitable for all kinds of farming. The dark uplands, with clay subsoil, generally have a deep soil, in depth from 10 to 20 feet, and are well adapted to wheat, barley, or general farming. They endure drought and wet better than any other, and are easily cultivated.

Sutter has an almost unlimited water supply. Yuba River and other smaller streams head high up in the Sierra, and are fed by the melting snow of summer, and these furnish abundant water for irrigation where it is necessary to resort to artificial watering of the land. The land surface presents no engineering difficulties, and ditches are easily and cheaply constructed. While the ample rainfall of the winter months renders irrigation unnecessary in a large part of Sutter County, there is a great deal of land which requires the application of water in the summer months to insure crops. This is especially the case in the foothill region. There are a number of old mining ditches which have fallen into disuse with the decadence of mining, which can and will come into service again for the use of the orchardist and vineyardist.

Sutter has the honor of being the pioneer horticultural county of the Sacramento Valley. The first attempts in this line were made by General Sutter, at Hock Farm, in 1842, when he planted grapes, pomegranates, and a large grove of fig trees. The productions of this county will cover almost the entire line of horticultural products of the State. Oranges and lemons, while not extensively grown, do well where they have been tried, while peaches, pears, plums, apricots, nectarines, figs, pomegranates, and other deciduous fruits seem to find in its soil and climate the very conditions they require for perfect growth. One of the largest peach orchards in the State, covering 575 acres, is near Yuba City.

One of the best arranged and most productive orchards of Sutter County is that owned by H. P. Stabler. Last year the product of this orchard was 500 tons, most of which was shipped East, the remainder being sold to the Yuba City cannery. The fruits raised there are of different varieties, consisting of peaches, prunes, apricots, and nectarines, and, because of their superior quality, have always commanded the highest prices, both in local and Eastern markets. The orchard, comprising 100 acres, was planted in 1885, and is divided as follows: Planted to peach, 60 acres; prunes, 25 acres; apricots, 8 acres; and nectarines, 7 acres. The land being high produces a better quality of fruit for shipping purposes, as the fruit contains more saccharine matter and is much drier than fruits produced on low land.

Another prominent orchard of Sutter County is the Abbott orchard, on the west bank of the Feather River, about 9 miles from Marysville. The orchard contains 425 acres; the first 50 acres were planted in February, 1883. In 1885 the sales of fruit from this 50-acre lot amounted in round numbers to \$6,000, and the next season to \$12,000. Since that date the production has largely increased, but has not been kept separate from the balance of the orchard.

The small fruits and berries reach perfection on the slough and bottom lands of Sutter, where they thrive without irrigation. On the higher and drier lands irrigation is necessary in their culture.

The principal fruit sections of Sutter County are found along the

Feather River, some small sections on the Sacramento River, and in the foothills near the Marysville Buttes. The varieties best adapted to growth in these localities are peaches, pears, prunes, and plums. Cherries, figs, apples, and almonds are also grown, but not to the same extent as the first-mentioned varieties. The crop is disposed of to the local canneries and in San Francisco, while a very large percentage finds its way to the Eastern markets. That which is shipped East is packed in standard boxes and crates, and for the San Francisco and local canneries it is forwarded in regular orchard boxes. The output of fruits of different orchards in Sutter County during the year 1891, and for the present year, is given below:

	1891—lbs.	1892—lbs.
Apples.....	392,450	391,600
Apricots.....	2,052,300	1,625,000
Cherries.....	495,400	526,200
Figs.....	54,250	58,000
Olives.....	31,700	32,000
Peaches.....	7,459,100	9,696,830
Pears.....	2,550,000	2,800,000
Prunes.....	1,257,300	838,200
Plums.....	639,500	592,000
Lemons.....	1,000	1,200
Oranges.....	32,600	35,000
Almonds.....	48,000	60,000
Raisin grapes.....	2,508,000	3,110,000
Table grapes.....	600,000	800,000
Totals.....	18,121,600	20,566,030

The prices for the seasons of 1891 and 1892 were as follows:

	1891.	1892.
Apples.....	1½ to 2c.	2 to 2½c.
Apricots.....	1½c.	2 to 2½c.
Cherries.....	5 to 7c.	5 to 10c.
Peaches.....	1½ to 2c.	2 to 2½c.
Pears.....	1¾ to 2c.	1¾ to 2½c.
Prunes.....	6½c.	9½c.
Plums.....	1 to 2c.	2 to 3c.
Almonds.....	11c.	12½c.
Raisins.....	5c.	5c.
Table grapes.....	2 to 2½c.	2 to 3c.

The crop of prunes and apricots is short for the present season. All the other fruits yield a fair average crop.

ACREAGE AND VARIETY OF FRUITS IN SUTTER COUNTY.

Variety.	Acres in Trees.			
	Bearing.	Non-Bearing.	Total.	Plant of 1892.
Apple.....	40	36	76	12
Apricot.....	164	63	227	21
Cherry.....	37	4	41	1
Fig.....	14	70	84	20
Olive.....	13	4	17	2
Peach.....	597	384	981	120
Prune.....	148	79	227	28
Pear.....	170	222	392	50
Lemon.....	1	1	2	
Orange.....	3	24	27	6
Nuts—Almond.....	159	145	304	50
Walnut.....	13	2	15	1
Raisins.....	418		418	
Table grapes.....	34		34	
Totals.....	1,811	1,034	2,845	311

TEHAMA COUNTY.

Tehama County is situated on both sides of the Sacramento Valley, and reaches from the summit of the Sierra Nevada Mountains on the east to the summit of the Coast Range on the west, with the Sacramento River running through the center from north to south. It is bounded by Shasta on the north, Plumas and Butte on the east, Butte and Glenn on the south, and by Mendocino and Trinity on the west. It has a breadth of 38 miles from north to south, and a length of 78 miles from east to west, giving it an area of 3,125 square miles, or nearly 2,000,000 acres.

The surface of Tehama County consists, first, of a section of the Sacramento Valley, which, below Red Bluff, expands into a broad and level plain, swells on the west into low, level prairies, that further on lift into broken hills, with the steep and rugged slope of the Coast Range beyond. Heading in these mountains, numerous streams flow east into the Sacramento, the principal of which are the Cottonwood, Dibble, Reed, Red-bank, Elder, Thomes, and Stony Creeks. On the east this valley is bounded by a lava flow, which extends for 20 miles or more up the western slope of the Sierra Nevada Mountains. Through these lava beds the large streams that carry the water caused by snow and rain on the slope of the Sierra Nevada have eroded deep, dark, and craggy cañons; above these lava beds the Sierra becomes more precipitous, rising at some points to an altitude of more than 10,000 feet.

To the north Mount Shasta lifts itself to a height of 14,442 feet above sea-level, 7,000 feet being covered with perpetual snow. On the east the Sierra Nevada stands a great wall, linking the towering dome of Shasta and Lassen Butte, a volcanic cone over 10,000 feet high. To the west is the Coast Range, less lofty, but even more sharp and craggy in contour than the Sierra. The dark green of the coniferous forests that cover the lower slopes of these mountains contrasts strongly with the fields of snow that rest on their summits.

Dr H. Latham gives the following graphic description of Tehama climate, and the causes for its peculiarities:

"The climate of Tehama County is one of the great advantages which it has to offer the home-seeker and health-hunter. It is hard for an Eastern person to believe that here, on and even above the 40th parallel of north latitude, there is a country with a winterless climate, where all the semi-tropical productions mature, and flowers bloom in the open air every month in the year; while he, living no farther north, has six months winter, several feet of snow and ice, and fierce chilling blasts. For the benefit of such Eastern people, the causes of our climate are here briefly given. There is a river in the ocean, says Maury, in his luminous description of the Atlantic. That river is the Gulf Stream, which rises on the equator, and, sweeping across that ocean, washes the western shores of Europe. It gives England and Ireland, in their northern home, the climate of the middle temperate zone. It makes Liverpool warmer in winter than New York, a thousand miles farther south. It makes France a land of vine and ivy, in the same latitude as the ice-bound Gulf of St. Lawrence. There is a river in the Pacific Ocean larger and more potent than the Gulf Stream. It rises on the equator, under a burning, torrid sun, and, sweeping north and around the earth's great circle, washes the whole coast of Northern California. From this heated river of the ocean the warm, balmy breath of the tropics comes, and confines winter to the higher altitude of the mountain regions, and gives the lower altitudes over to the fig, the orange, the olive, and the pomegranate.

"There is a further geographical cause of this climate besides the ocean current. The sweeping blasts from the ice and snowfields of the arctic regions produce the intense winters of the northern temperate zone the world around. The freezing north winds of Europe and the Eastern States, and the terrible blizzards of the Mississippi and Missouri Valleys, leave the arctic region. The effects of these cold winds are felt as far south as the Rio Grande. Texas and New Mexico have had northers that have killed thousands of cattle. These arctic winds are completely shut out of California. At the extreme western point of the Alaskan peninsula, 1,500 miles west of San Francisco, there is the commencement of a giant mountain barrier, which runs southeast for 500 miles, and thence south to and into Mexico. This great and continuous barrier deflects the arctic winds to the East, and gives California a complete protection from them.

"The influence of these two great agencies—the ocean current and the mountain barrier—is to be seen in the case of Auburn and Truckee, on the Central Pacific Railroad. These two points are only 80 miles apart, Truckee being on the eastern side of the mountain barrier and Auburn on the western side. Truckee, subjected to the arctic winds, and deprived, to some extent, of the influences of the warm ocean currents, grows semi-tropic fruit, and has yards and gardens embanked in flowers all through the winter. These are the influences that give Tehama County a winterless climate. Her mean annual temperature is 63° F. The monthly mean temperatures are as follows: January, 45°; February, 49°; March, 55°; April, 59°; May, 66°; June, 78°; July, 83°; August, 80°; September, 75°; October, 62°; November, 54°; December, 47°. The lowest temperature ever recorded in the valley portion of the county is 19° above zero. The average number of clear days in the year are 225.

"The average annual rainfall in the county is about 30 inches, which

is more than falls farther down the valley. This large rainfall is very important to the agriculturist. It not only insures a much larger crop on the same kinds of soil, and with the same tillage, but insures against crop failures, as half that amount insures a fair crop. Half the rainfall of Tehama is more than the average amount of rain in some other portions of the State.

"The settlers of California are mainly Eastern people, and they still follow the habits of the people in the north temperate zone. They still speak of spring, summer, autumn, and winter as though we had those well-marked seasons here. The use of these terms is misleading to the Eastern mind. It should be understood that we have only two seasons in the Sacramento Valley—spring and autumn. The temperature is always so mild that with moisture vegetation would grow the whole year. The first rains of autumn bring spring, and everything bears the vernal green and brightness of that season so long as the rain lasts. When the rains cease, which is usually about the 1st of June, then everything takes on the appearance of autumn, and the whole country wears autumn colors till the rain comes again in November. There have been flurries of snow, but there has been no snowfall since the American occupation that outlasted a day's sun, and usually the snow melts as fast as it falls. In the temperatures, rainfall, winds, and the number of clear, bright days, there is no locality on this coast more favored than Tehama County.

"Tehama County embraces some of the finest soils in the State. They are mainly alluvial and volcanic in their origin. The Sacramento River, or its ancient predecessor, has deposited on either bank wide stretches of rich alluvium. On the east side is a dark brown, almost black, sandy loam, many feet in depth. Still eastward the land rises into slightly rolling hills of reddish soil, which soon run into the rough untillable lava beds. On the west bank the plain of tillable lands is wider. The soil on this side is in considerable part of a reddish tinge. The chief characteristics are the loamy river lands merging into a clayey loam second bottom; then the sandier soil of the plain, varying in color from gray to brown and red; then the roll of the hills begins, with reddish soil and gravelly loam predominating; next the bald hills of gray, brown, red, sometimes black, clayey loam, commonly called 'adobe' hills, and still westward the hills rise higher, carrying a similar clayey loam covered with trees and underbrush abundant for firewood and not difficult to clear; and last, the elevation reaches the pine-clad summit of the Coast Range. The bottoms along the different creeks that flow into the river have their several peculiarities; but the usual soil, especially on the west side of the valley, is a yellowish alluvium, the area being generally not very wide, and joining more elevated benches of the soils already described. North of Red Bluff the soil undulates to the river banks, and is chiefly of a reddish clay and gravelly loam, and the wooded growth is more general.

"There is very little waste land from the foothills of the Sierra to the foothills of the Coast Range. The beds of the streams constitute the greater portion of it. The different grades of soil will be viewed by different persons with widely varying opinions respecting their merits for profitable culture, yet there is very little doubt that all the soils, from the river bottoms to the coarsest gravelly hills, will be found available for some kind of husbandry. There is but very little of these lands

that does not show a natural growth of trees and grass, indicating a soil ready to reward the intelligent cultivator. Large crops of grain, yielding as high as forty and more bushels to the acre, both on the bottom, the adobe hills, and the plains between, have fully demonstrated the fertility of all classes of the soil."

In regard to horticulture in Tehama County, P. H. Coffman writes:

"With all our great advantages, we can boast without stint of our capabilities in the production of fruit. Growing side by side we have the lemon and peach, the olive and apple, the orange and pear, the citron and watermelon, all in the open air, asking and needing no protection from the weather or climate. Not only do these fruits and many more grow here, but they grow well, due to the peculiar topography of the county, the soil, and the climate. One grand advantage we possess, is that our fruits all grow without irrigation, requiring no care other than good cultivation, a requisite, also, where irrigation is practiced; still, we claim that the fruits thus naturally grown are better in size, shape, color, and flavor than those grown elsewhere in the State. There is a crisp firmness about our peaches, apples, and grapes peculiar to this county itself, which gives the fruit better preserving properties in shipment or for market. Our farmers, who have given their attention heretofore solely to grain growing and stock raising, are not as well versed in fruit culture as, with the advantages we possess, is desirable; but, with new lessons, they are steadily learning what has long been neglected, and the vast sales of fruit trees of the past three years will in a short time to come result in orchards, proving that Tehama County excels in other branches of industries than those heretofore followed. When the first settlers set eyes upon the great tracts of land on each side of the Sacramento River, from Red Bluff to Stony Creek, and from one range of mountains to the other, it was a waving field of oats, so thick in growth and so high that one on horseback would be concealed; and this fact alone was sufficient to prove to the great numbers who are now following, that a region of great fertility exists in Tehama County.

"At present the great fruit-growing district is along Deer Creek, whereon are situated some forty large gardens. The main product is peaches, cherries, plums, apricots, nectarines, pears, and figs, and all deciduous fruits, which grow abundantly. Irrigation is practiced in that vicinity, and the land is rich. Clingstone peaches from Deer Creek are rich in flesh, flavor, and color, and some measured fifteen inches in circumference, capable of lasting several weeks in the open air after plucking. Peaches of a similar variety have been grown without irrigation on Reeds Creek, fully as large, and equaled the Deer Creek fruit in color, flavor, and preserving properties.

"All the varieties of grapes can be abundantly and profitably grown here. For the cultivation of the raisin grape, our soil rivals the very best in the State. Bartlett pears of the best quality are produced freely, and will be a very profitable crop. Much attention is being given to the cultivation of prunes, which will be one of the chief fruit products of the county, as well as one of the most profitable. Irrigation is not necessary to the growing of good fruit, and many think it even undesirable.

"Developments of the past few years have proved that our foothill lands are especially well adapted to growing fruits, particularly those

above enumerated, and oranges hold as firm as any. These facts have induced our land owners to believe that citrus fruits are adapted to this county. They grow without much care, there being no need of protection from climatic influences. The result is that there are but few places in the county without orange trees, and this year a large number will be set out. Heretofore, oranges, lemons, pomegranates, figs, and similar semi-tropical favorites have been planted in grounds for ornamentation, and their extraordinary development has proved that they may be planted for commercial purposes as well as beauty.

"Figs are remarkably prolific in the county, often three to five crops maturing each year. Like oranges, no commercial value has been placed upon them in the past, the large beautiful leaves of the trees being admired for their novelty and shade, and figs could be obtained for the mere trouble of picking. Figs are easily grown, a few years developing a large tree from an ordinary slip.

"Apples do not prosper as well on the bottom lands as in the foothills and mountains. Those from the latter regions are as good as the best grown in Oregon for taste, flavor, and color, and are better in size, and will keep for months after picking. In the mountains apples ripen as early as May, and keep ripening through the various varieties until about the first of November, and yet attention to diversified species has not been given until very recently. The winter apples are really beautiful, the rich golden or crimson sheen as bright as the highest polished rosewood, while the flesh is white, firm, and unspotted. Spitzenberg, Bellflower, Baldwin, and June apples have been and will long remain the favorites.

"What has been said of the above fruits might be aptly said of all. We have seen a branch from a plum tree, about three feet in length, which had one hundred and thirty plums clustered as close as it was possible for them to grow. It is no rare occurrence for orchardists to pluck blossoms from the branches of peaches, apricots, almonds, and other like fruits, to save the trees from the great weight of the fruit. Fertilization has not been considered to any extent, growers depending solely upon the virgin richness of the soil after cultivation; in fact, many times the rich manure of the barn has been thrown into some gully to fill it up, rather than scattered over the ground.

"Besides fruits proper, we have those species which are classed under the head of nuts, vegetables, and berries, and they do as well as the fruits. There are more peanuts raised in Tehama County than elsewhere in the State, the annual product being about 1,000,000 pounds. Almonds grow early, and are of superior quality, both hard and soft-shell. Walnuts of the English and American species are generally used for shade trees; the fruit grows large, and is sweet and juicy. All the small berries grow in profusion—strawberries, raspberries, blackberries, the latter indigenous to the soil. Wild grapes and elderberries grow in all parts of the county along the creeks, and the grapes may be gathered for jelly as late as January. Strawberries do not continue during a great part of the year, for want of proper culture, but those grown reach an enormous size.

"There are some fruits and plants which have been grown for ornamentation, which show that our soil and climate are well adapted to their culture. For instance, citron trees have grown without protection in Red Bluff. Olives have matured in several parts of the county.

Hickory and chestnuts are common as curiosities, while magnolias, acacias, oleanders, palms, and Japanese persimmons are seen to a greater or less extent in all gardens. Yet we can see in the same gardens the cypress, elm, locust, pine, mulberry, and poplar. Where under the sun can such a variety of climatic extremes, as shown above, be seen? Florida with its oranges, France with its grapevines, the East with its peaches and apples—we can excel all in their best productions in Tehama County. And still, with a million acres of tillable lands we have but about 16,000 men, women, and children to occupy them."

The chief fruit sections of Tehama County are: Vina for peaches, apricots, and prunes; Tehama, peaches, apricots, and prunes; Thomas Creek, pears, peaches, and apricots; Antelope Valley, pears, peaches, apricots, and olives; Battle Creek, pears, apples, prunes, and peaches. Besides the varieties named, all deciduous fruits, and in some localities citrus fruits, do well. Cherries are not grown to any great extent, but almonds are growing rapidly in popular favor. The principal markets are found in the East, and large shipments are made from Tehama to Boston, New York, and Chicago. Shipments of fruit made last season arrived at Boston in excellent condition. A carload of prunes was shipped direct from Red Bluff to New York, and another car to Chicago. Some fruit is shipped green, but the crop is principally dried. It is claimed that apricots will ripen a month earlier in Tehama County than in most of the coast counties, and are ready for shipment East as early as July 1st to 10th.

For drying fruit, Tehama possesses great advantages in the way of climate. The apricot, peach, and prune crop are dried in the sun, apricots and peaches drying with two days' exposure to the sun on the tray.

The following prices were paid during the last two seasons for fruit at Red Bluff:

	1891.	1892.
Apricots.....	8½c.	11c.
Peaches.....	5½ to 6c.	
Prunes.....	6½c.	
Green apricots.....	1½c.	

Tehama, in the past, has been a wheat county, but it is rapidly changing to a horticultural county. During the past few years a very extensive acreage has been set to fruit. Among other large plantings are Governor Stanford's Vina fruit ranch of 2,000 acres; at Cottonwood Creek, A. T. Hatch, 500 acres; Carnell, Fitzhugh & Hopkins, 250 acres; at Red Bluff, N. P. Chipman, 446 acres; A. T. Hatch, 80 acres; at Thomas Creek, J. Eddy, 40 acres; William Duncan, 60 acres; John Flournoy, 50 acres; J. S. Cone, 300 acres, and sundry orchards, over 1,000 acres.

The crop of the present season is light—apricots and prunes not more than one third, peaches fair, pears averaging fair to middling, and in some localities total failures are reported. This was due to the lateness of the spring, combined with the severe frosts experienced during the preceding period.

ACREAGE AND VARIETY OF FRUITS IN TEHAMA COUNTY.

Variety.	Acres in Trees.			
	Bearing.	Non-Bearing.	Total.	Plant of 1892.
Apple.....	38	48	86	12
Apricot.....	243	331	574	107
Cherry.....	25	34	59	8
Fig.....	33	92	125	76
Olive.....	10	97	107	43
Peach.....	2,102	1,080	3,182	213
Prune.....	600	728	1,328	240
Pear.....	221	296	517	83
Quince.....	12		12	
Lemon.....		2	2	
Orange.....	2	13	15	6
Nuts—Almond.....	55	311	366	121
Walnut.....	4	26	30	6
Raisins.....	607		607	
Table grapes.....	310		310	
Small fruits.....	40		40	
Totals.....	4,302	3,058	7,360	915

TRINITY COUNTY.

Trinity County is bounded by Siskiyou on the north, Shasta and Tehama on the east, Humboldt on the west, and Mendocino on the south. It is oblong in shape, its greatest length running north and south for 90 miles, while its width from east to west, at its widest part, will not exceed 55 miles. Its area is 2,625 square miles, or 1,680,000 acres, all included in mountains. Mountain barriers inclose the county on three sides. Upon the north lie the Scott Mountains, upon the east the Shasta, and upon the west the Coast Range. These extend their spurs into all portions of the county, leaving but a small part of its area free from their contact; the entire surface of the county is, in consequence, broken, rugged, and precipitous. To this formation the county is indebted for its abundant water supply, and it is watered by numerous streams, all having their sources in the county, and flowing eventually into the ocean on the west. Trinity River, the largest of these, rises in the north, flows southward for about 40 miles, and then turns sharply to the northwest, receiving in its course the waters of many tributaries. The southern part of the county has also many streams, and is a mass of high, rugged mountains.

Weaverville, the county seat of Trinity, has an altitude of 2,000 feet, and its climate differs little from that of other places of like altitude. In the summer the mercury will get well up in the nineties, and occasionally reach as high as 105° or 106°, but this is rare. The nights are always cool. The winters are cold for California, and frosty nights are not uncommon, the mercury sometimes touching 10° above zero, which is the lowest recorded. Owing to the altitude of the county at all points, the atmosphere is dry and pure, and the extremes of heat and cold do not cause so much discomfort as they would in less elevated regions. There is an average rainfall of 46 inches a year, the smallest precipitation recorded being in 1874-75, when there were 24.72 inches, and the heaviest in 1877-78, when 63.95 inches were reported.

Trinity is essentially a mining county, and but little attention has

been paid to horticulture. Hay Fork Valley is about 10 miles long and from 1 to 2 miles wide. Through it runs Hay Fork and Salt Creeks, and there are numerous springs in it. Trinity Valley is about 18 or 20 miles long and from half a mile to 2 miles in width. The Trinity River passes through it. These are the two largest valleys in the county, and outside of these the agricultural land is generally found in small patches. Some fruit is grown for home consumption, and apples, pears, and plums do well. Berries of all kinds thrive and yield abundantly.

Trinity is not a fruit-growing county, but along the streams, rivers, and in the mining towns and stock ranches are small family orchards, the chief of which are found at Weaverville, Junction City, and the surrounding vicinity. W. H. Loudon, near Weaverville, has the largest orchard in the county. This is 20 acres in extent, and was planted in 1854, and has been in continuous bearing since 1860. The fruit grown there consists of apples, pears, and the more hardy varieties of deciduous fruits. Some berries, almonds, and walnuts are also grown in this county; but little fruit finds its way to the outside market, that grown being consumed by the mining camps and the people of the county. Some small quantities of apples are exported, which find their way to San Francisco, but these are so limited in amount as to cut no figure in the market.

ACREAGE AND VARIETY OF FRUITS IN TRINITY COUNTY.

Variety.	Acres in Trees.			
	Bearing.	Non-Bearing.	Total.	Plant of 1892.
Apple.....	22	20	42	4
Apricot.....	2		2	
Cherry.....	2		2	
Peach.....	25	10	35	
Pear.....	20	30	50	5
Plum.....	3		3	
Nuts—Almond.....	1		1	
Walnut.....	20		20	
Table grapes.....	60		60	
Small fruits.....	30		30	
Totals.....	185	60	245	9

TULARE COUNTY.

Tulare County is bounded on the north by Fresno, on the east by Inyo, on the south by Kern, and on the west by Fresno and Monterey Counties. Its territory extends from the summit of the Sierra Nevada Mountains on the east to the summit of the Coast Range Mountains on the west, varying in width north to south from 50 to 60 miles. The greatest length of the county east and west, from the summit of one range to the other, is about 140 miles. The valley proper contains 1,136,000 acres; the lower foothills, 249,000 acres; the mountainous portion of the Sierra Nevada, 2,086,800 acres, and the Coast Range Mountains, 128,000 acres.

Several years ago Tulare Lake covered 166,400 acres of land, but owing to the diversion of water from the numerous rivers that empty

into it, which has been taken out for irrigation purposes, at least one third of the land has been redeemed from overflow. Levees have been built and the land reclaimed for agricultural purposes.

The average elevation of the plain lands above sea-level is about 300 feet. There are 256,000 acres of timber lands on the plains, the timber being almost entirely oak, with an intermixture of cottonwood.

The mountain portion of the county comprises about one fifth of its total area. The Sierra Nevada Mountains reach their greatest height and grandeur in Tulare County, culminating in the lofty peak of Mount Whitney, which rises to an altitude of 15,056 feet. From Mount Whitney the summit-line of the range gradually lessens in height toward the north, but more rapidly toward the south. The average height of the range in Tulare County is about 8,000 feet, and the distance from base to summit is not more than 60 miles. The mountains, in their higher altitudes, are covered with extensive forests of pine, fir, cedar, tamarack, and the famous redwood trees. The lower foothills are covered with white-oak forests, which are principally valuable for the masts they produce. In the mountains are numerous meadows, producing nutritious grasses, where flocks of sheep and herds of cattle are annually fattened. Here and there throughout the range are level pieces of land, where settlers have located, and who, in addition to stock raising, are engaged in cultivating orchards, especially in the lower foothills. As fine apples as were ever grown are produced here at an altitude of 4,000 feet. At a much lower elevation are found small coves where frosts are unknown, and here we find oranges, lemons, and various varieties of vegetables. So free from frosts are those localities that tomato vines have been known to retain their life and produce fruit for years.

The average elevation of the Coast Range is not more than 1,200 feet, and the distance from base to summit 12 miles. There are few valleys in this range, but the mountain sides produce grasses that are unsurpassed for feed.

The rivers and smaller streams that flow into the valley have their sources in the Sierra Nevada Mountains. The largest of these is Kings River, which has a drainage area in the mountainous portions of Fresno and Tulare Counties of 1,853 square miles. The other streams in the county, all lying south of Kings River, in the order named, are: Kaweah River, with a catchment of 608 square miles; Tule River, with 446 square miles; Deer Creek, 130 square miles; White River, 96 square miles; Poso Creek, 278 square miles; total area of mountain and hill drainage, 3,411 square miles. There are several very small streams intervening between the large ones mentioned that have their sources along the foothills and are fed by springs and winter rains, but which carry little if any water during the greater portion of the year. However, they are of great value to the stock raiser, who, in early days, settled on and laid claim to the lands where they have their rise or sources.

The crests of the Sierra Nevada, towering far above the line of perpetual snow, present their white-crowned summits to view for hundreds of miles. Here is the source of those numerous streams which flow through this county, giving life and fertility wherever they reach. It is nature's reservoir, and inexhaustible. During the hot summer months this snow gradually melts and keeps up the volume of water in the rivers. The supply is never exhausted, and the summer consumption always repaired by the winter precipitation.

The climate of Tulare County is similar to that of other interior counties of California. There are two seasons—the wet and the dry. The rainy season generally commences in December, though occasionally, and only occasionally, there are showers as early as September. The rainy season closes in April. There are, on an average, 220 cloudless days in the year. Owing to the extreme dryness of the atmosphere sultry weather is almost unknown. The extreme hot weather is in the months of July and August, when the thermometer ranges from 85° to 112°. To the Eastern readers, however, thermometrical readings are apt to convey a wrong idea of our climate. In the Eastern States a temperature of 90° is unendurable, and a temperature of 110° would mean wholesale death. In California 90° is comfortable, and even 112° would be endurable. The extreme dryness of the atmosphere causes the difference, the heat here being dry, while that of the East is moist and suffocating. Cases of sunstroke are unknown, and even on the hottest days men can work in the full glare of the sun without inconvenience or damage. With the setting of the sun the heat is speedily radiated, and cool, refreshing nights amply compensate for the occasional hot days. It is the warm, dry weather that gives value to this section, especially for curing the raisins and drying fruit.

The winter months are the loveliest of the year. Flowers are in bloom from the first fall rains until late in the spring or early in the summer, and the appearance of the wide plains bedecked with wild flowers of every hue in midwinter is a cheery sight. There are occasional frosty nights on the plains, but the frost is not severe enough to check farm work. Ice forms occasionally from the thickness of a pane of glass to half an inch, but it disappears with the morning sun. Snow has fallen in the valley, but such a thing is so rare that citizens, generally, are not able to state the date on which a snow storm occurred.

The following table will give a pretty good idea of the climate of Tulare County. It was kept for Visalia, and will differ but little in other parts of the county:

REPORT OF SECRETARY—TULARE COUNTY.

Date.	Rainy Days in Month.	Rainfall for Month.	Highest Thermometer.	Lowest Thermometer.	Average Thermometer.	Highest Barometer.	Lowest Barometer.	Clear Days.	Cloudy or Hazy Days.
1888—January	6	3.05½	60	27½	44.16	29.93	29.27	15	16
February	2	.16	64	46	55.10	29.80	29.39	16	13
March	7	1.61	68	52	57.96	29.70	29.42	14	17
April	1	.14	94	60	75.93	29.80	29.45	23	8
May	0	.00	95	70	80.03	29.58	29.41	22	9
June	0	.00	104	84	89.00	29.70	29.36	24	6
July	0	.00	106	92	97.00	29.55	29.38	30	1
August	0	.00	107	93	100.00	29.55	29.39	30	1
September	1	.35	106	80	98.00	29.59	29.60	29	4
October	0	.00	88	72	80.00	28.67	29.47	19	12
November	5	2.39	75	57	65.00	29.65	29.31	6	26
December	5	1.70	58	48	54.00	29.77	29.44	1	20
1889—January	3	.70½	63	44	51.51	29.76	29.14	15	13
February	2	.36	70	49	62.96	29.70	29.40	16	12
March	7	3.45½	82	59	71.96	29.77	29.08	20	11
April	2	.49	92	62	77.26	29.69	29.45	17	13
May	2	1.22	99	61	83.70	29.70	29.37	23	8
June	0	.00	101	87	96.20	29.53	29.31	15	15
July	0	.00	106½	92	99.08	29.60	29.32	31	—
August	0	.00	105	90	95.96	29.60	29.32	15	16
September	0	.00	100	80	91.46	29.75	29.40	15	15
October	6	4.08	92	59	72.22	29.77	28.31	14	17
November	5	.66	67	56	62.93	29.85	29.41	10	20
December	19	3.21	64	48	56.35	29.90	29.39	8	23
1890—January	8	3.34	58	40	49.64	29.94	29.41	16	15
February	6	1.12	65	46	56.64	29.97	29.42	12	16
March	6	1.10	75	51	64.00	29.99	29.43	17	14
April	2	.25	86	64	72.90	29.80	29.45	17	13
May	3	.46	98	66	81.80	29.80	29.41	17	—
June	0	.00	97	74	87.63	29.72	29.42	22	8
July	0	.00	104	89	96.06	29.62	29.30	30	1
August	0	T.	101	86	95.03	29.66	29.37	14	17
September	3	.73	95	70	86.83	29.65	29.38	11	19
October	0	.00	81	65	75.87	29.74	29.41	13	18
November	2	.51	77	52	66.60	29.79	29.41	15	16
December	6	2.36	65	41	50.83	29.98	29.60	—	31

Rainfall for 1888, 9.40½ inches; rainfall for 1889, 14.18 inches; rainfall for 1890, 9.87 inches.

The soil of Tulare County varies in character. Along the foothills, or on what may be termed the bench-lands, it is a red loam, as a general thing, though there are places where the soil is black adobe. Along the base of the foothills the soil is reddish. In the '76 country, south of Kings River, the land is what is known as "white ash." Farther west it is more sandy, with occasional beds of alkali. Tulare Lake lands are sandy, intermixed with considerable organic matter. In the delta of the Kaweah River the soil is a deep alluvium, with firmer soil here and there. With its variety of soil no county in the State can show so large a body of productive land as can Tulare.

There is a strip of land along the base of the foothills of the Sierra Nevada Mountains where oranges may be grown, as has been demonstrated both at the north and south ends of the belt. These lands are also valuable for growing the raisin grape. The red lands, and in fact all the territory of the county outside of the bottom lands and the timber belt, are peculiarly adapted to the raisin grape. The raisin grapes

grown in Tulare County are exceedingly large, of fine flavor, and contain all the properties that go toward making a first-class and marketable raisin. The timber belt and bottom lands are better adapted to the table grape.

As early as 1853 two or more irrigating canals had been constructed to bring water to the lands in the vicinity of Visalia. These ditches demonstrated what Tulare land would do under water, and the evident fertility of the land wherever water was put appealed to intending settlers and gave an impetus to settlement. In 1873 a large immigration began to the county. The new-comers were people of enterprise, and immediately on their arrival commenced the construction of irrigating canals, until to-day there are more than 500 miles of main water ditches in the county, with probably an equal extent of small branches.

The '76 Canal, now the property of the Alta Irrigation District, obtains its water from Kings River, at a higher point than other canals taking water from that stream. The main canal is 35 miles in length, and supplies lateral canals of the same length. It was constructed at a cost of about \$200,000, and will irrigate 200,000 acres of land. When this canal was under the control of private individuals it cost \$1 per acre per annum to irrigate lands under it. It is now estimated that the same canal, under the control of the irrigation district organized under the Wright Act, can supply water at 50 cents per acre per annum, and at the same time irrigate a much larger territory.

There are five other ditches, or canals, taking water out of Kings River for irrigating lands lying west of the '76 Canal, and in what is known as Lucerne Valley (formerly called Mussel Slough). These are the People's Ditch, 32 miles in length; Mussel Slough Ditch, 20 miles; Last Chance, 31 miles; Lower Kings River, 21 miles; Rhodes Ditch, 10 miles. The aggregate cost of these five ditches is estimated at \$220,000. The Lakeside Ditch, constructed to convey water along the eastern boundaries of the same territory, obtains its waters from the St. Johns River, and is 32 miles in length, and cost \$50,000.

Lucerne Valley, watered by the six canals last mentioned, contains 115,000 acres of irrigable lands, at least three fourths of which are now receiving water from the ditches named.

There are fourteen or fifteen canals diverting water from the Kaweah River. A number of these were constructed with plow and shovel, long before approved appliances for ditch building came into vogue; hence, it has been impossible to ascertain the actual cost of many of them. Among those more recently constructed are the Watchumna, carrying water to lands west of Visalia, and the Kaweah Canal, that carries water to the vicinity of Tulare City.

Ten years ago the fourteen ditches leading out from the Kaweah River were used to irrigate less than 25,000 acres of land; to-day these same ditches are carrying water over at least three times that area.

The waters of the Kaweah River proper empty into numerous other streams, among them Cross Creek, Mill Creek, Packwood Creek, Deep Creek, and a number of sloughs, from whence they are diverted into ditches or canals and carried from 4 to 10 miles to dry lands. There are about 215,000 acres of irrigable land under the watershed of the Kaweah and the streams debouching therefrom, and the past two seasons have satisfied the people that there is water enough to irrigate every foot of this when it is properly and carefully handled.

There are thirteen canal companies taking water from Tule River, but there are less than 12,000 acres of land being irrigated by its waters. The water of Tule River is not perennial, and much of it is wasted by seepage. There are about 138,000 acres of land that should properly be irrigated from this source. Two irrigation districts are now in process of formation, under the Wright law, and two years hence, it is confidently believed, enough water will be had from Tule River to irrigate nearly all of the land in the district, which extends from Porterville on the east to Tulare Lake on the west, and from Lindsay on the north to a point midway on the south between Porterville and Deer Creek.

Deer Creek is a small stream, and its waters disappear, as a general rule, in June and July, except at a point well up in the foothills. The principal canal diverting water from this stream is the Sausalito Ditch, constructed about seventeen years ago for the purpose of carrying water to a point 12 miles west from where the waters enter the plains. This ditch covers less than 2,000 acres of land, and it is probable that not more than 2,500 acres of land are watered by Deer Creek.

An irrigation district has been formed to utilize the waters of Poso Creek, and the day is not far distant when the waters of that stream, as well as those of White River, will be used for irrigating the lands east, northeast, and southeast of Delano.

It will be seen from the above that Tulare has at last awakened to the importance of her water resources, and is making rapid advance in their development. It is but a few years since the people of this county were skeptical with regard to the possibility of getting sufficient water to irrigate any great body of the arid lands which surround them. The experiments so far made have amply demonstrated that there is in this county ample water for all purposes when it is properly husbanded and distributed. Too much water was formerly used, when it was considered necessary to soak land for days or weeks to make it productive. In the older irrigated districts it is found that continuous irrigation saturates the land, and where a few years since surface water could not be found at less depths than 20 to 25 feet, it is now found at 6 and 8 feet, and in some cases at even less depth. In many places, instead of the question being one of irrigation, it has now become one of drainage.

Artesian wells to the number of about two hundred have been bored in that part of the county lying west of the main line of the Southern Pacific Railroad, and extending from Lemoore, north of Tulare Lake, in a half circle to Pixley, which lies east of Tulare Lake. The full extent of this artesian belt is about 700 square miles. The first well was sunk in 1879, at Tipton, by the Southern Pacific Railroad Company. In boring this well, washed soil, or debris, was found at a depth of over 70 feet, and fish bones and pieces of wood were brought up from a depth of 80 feet. No rock is encountered in boring these wells, strata of gravel and clay succeeding each other from the surface to the greatest depth. The depth of the wells varies from 300 to 600 feet, though there are several which are 800 feet deep. The mean average depth between the shallowest and deepest well is about 450 feet. It is claimed for some of these wells that they have a flow of water sufficient to irrigate 160 acres of land. The average artesian well costs from \$800 to \$1,000.

IRRIGATION WORKS IN TULARE COUNTY.

Name.	Miles.	Assessed Value.
Kaweah Canal and Irrigating Co.	25	\$7,500
Consolidated People's Ditch	4	8,000
Last Chance Ditch.....	10	15,000
Kaweah and Mill Creek	5	5,000
People's Ditch—main canal	7	14,000
People's Ditch—branch	12	1,200
People's Ditch—branch	8	400
Lower Kings River Ditch.....	14	7,000
Guffes' Side Ditch	5	500
Settlers' Ditch	15	1,500
Extension Ditch	3	1,500
Lakeside Ditch	25	5,000
Mussel Slough Ditch	3½	7,000
Pioneer Ditch	16	32,000
Totals	152½	\$103,600

Tulare County holds a place in the front ranks of the horticultural counties of the State, and nearly every variety of fruit grown in the State can be found within her borders. Of deciduous fruits, apples, plums, pears, cherries, peaches, apricots, nectarines, prunes, and figs all do well. In the Lucerne district, including Hanford, Lemoore, and Grangeville, are numbers of very large and profitable deciduous orchards, the fruit from which excels in size and flavor, and the yield of which is very large. In grapes, too, this county excels. At Tulare City, or rather in the country tributary to it, there are also extensive areas in deciduous fruits and raisin vines, and it is here that the celebrated Paige & Morton vineyard and orchard, one of the largest tracts under fruit in the State, is located. At Visalia are also extensive orchards devoted to the growth of deciduous fruits. Around Traver, also, numerous large orchards are found. Toward the foothill region citrus fruits do equally well with the deciduous varieties, and in Oroshi, Dinuba, Porterville, Plano, and the country between, are a number of very thrifty orange and lemon orchards. On the Pogue ranch, on the Kaweah River, is an orchard of old lemon trees that have been in bearing for a number of years, the fruit from which compares favorably with the best imported article. Nuts do well and yield profusely. For berries of different kinds, the soil and climate of Tulare seem especially adapted.

Of apples, many of the earlier varieties do well in the valley, and the later varieties in the foothills and mountains. Among the favorites grown here are the Winesap, White Winter Pearmain, Ben Davis, Rhode Island Greening, and Roman Beauty. Other varieties do well in the higher foothills, and the fruit is of excellent flavor.

Pears are grown successfully in all parts of the county, except in districts where the soil is strongly impregnated with alkali. The tree is long-lived, bears early, and yields very abundantly. The Bartlett is the favorite variety. The Winter Nelis, the Beurré Clairgeau, and Easter Beurré are largely grown, and are among the best shippers.

Peaches do well in all parts of the valley except on the alkali flats. Every variety does well, and Tulare peaches are celebrated for their size, flavor, and earliness. With the exception of Vacaville, and one or two other especially early localities, Tulare has her fruit first in market. At the State Board of Trade rooms, in San Francisco, Tulare County, among

her other products, has some remarkably large peaches on exhibition, surpassing in size those of any others exhibited there.

Apricots in Tulare County are an almost certain crop. They flourish in valley and foothill alike, and like other fruit there, bear young and come into market early.

Prunes do wonderfully well. Some of the stories told of prune orchards in that county seem bordering on the fabulous. From one seven-year old tree over 1,100 pounds of fruit, by actual weight, were gathered in one year, and 700 to 800 pounds is no uncommon yield. The trees begin to bear at three years old, and an average yield from a seven-year old orchard is 600 to 700 pounds to the tree. The great trouble experienced in this branch is liability to sunburn during the hot days, when fruit exposed to the direct rays of the sun becomes scorched and damaged.

Cherries do best in the foothill sections, and figs grow almost anywhere.

In citrus fruits Tulare is rapidly assuming a front position, and bids fair to share the honors in this line with Riverside. All along the foothills, where water can be obtained, oranges thrive. There are no damaging frosts or destructive winds, and at Porterville there are a number of fine orchards which have proved so profitable to their owners that large areas of new land are now being planted to citrus fruits in that section.

Tulare County holds a position in the front rank of fruit-growing counties in California. Every section of this county, except the mountainous portion, is adapted to fruit culture, and nearly every variety of fruit is grown there. The principal sections and favorite varieties are: Visalia, prunes, peaches, and plums; Hanford, raisins, prunes, and peaches; Lemoore, raisins, prunes, peaches; Grangeville, raisins, peaches, prunes, and pears; Traver, raisins, pears, figs, peaches, and prunes; Woodville, apples, pears, peaches, and figs; Farmersville, apples, peaches, and pears; Oroshi, raisins, peaches, prunes, apricots, and oranges; Porterville, oranges, raisins, lemons, prunes, and peaches; Limekiln, raisins, limes, and oranges; Plano and Pleasant Valley, oranges, lemons, and peaches.

Besides the varieties named, there are grown, to a smaller extent, nearly all known varieties of deciduous fruits and nuts, including plums, nectarines, almonds, walnuts, pecans, guavas, and, to a limited extent, the smaller fruits.

There has been a very great impetus given to fruit growing in Tulare County in the past few years, owing to the enormous output of the orchards in that section. Fully 50 per cent of the orchards now planted there are not yet in full bearing, about 20 per cent being planted during the season of 1892. The output of fruit for Tulare County is consequently small, when compared with the acreage and the cultivation. The principal fruits exported are raisins, prunes, peaches, and apricots.

There were shipped from Tulare County in 1891 sixteen cars of raisins and three cars of other dried fruits.

ACREAGE AND VARIETY OF FRUITS IN TULARE COUNTY.

Variety.	Acres in Trees.			
	Bearing.	Non-Bearing.	Total.	Plant of 1892.
Apple	104	43	147	10
Apricot	350	374	724	82
Cherry	1	5	6	3
Fig	50	132	182	91
Olive	30	290	320	130
Peach	2,160	1,640	3,800	522
Nectarine	56	72	128	30
Prune	1,971	3,150	5,121	967
Pear	350	292	642	58
Plum	37	52	89	12
Lemon	12	51	63	47
Orange	50	521	571	370
Nuts—Almond	3	4	7	1
Walnut	4	8	12	3
Raisins	10,264		10,264	
Totals	15,442	6,634	22,076	2,326

TUOLUMNE COUNTY.

Tuolumne County is situated on the western slope of the Sierra Nevada range, between the parallels of 37° 40' and 38° 20', and is bounded on the north by Alpine and Calaveras Counties, east by Mono County, south by Mariposa County, and west by Stanislaus and Calaveras Counties. A line drawn due east from San Francisco will touch the southernmost limits of Tuolumne, the county seat of which is distant from the metropolis 150 miles. The established boundary lines of Tuolumne are of such varied angles and with so great a divergence from the cardinal points that the territory it embraces takes the form of an irregular polygon. Tracing its boundary lines, commencing with the eastern at Mount Lyell, it traverses the crest of the Sierra Mountains to Castle Peak, a distance of 40 miles; thence the northern boundary line west 45 miles to the north tributary of the Stanislaus River; thence its western line 50 miles south, following the course of that stream to its junction with the main river, and along this to a point 5 miles above Knights Ferry; thence southerly 20 miles to the Tuolumne River. Leaving this point, its southern boundary corresponds nearly with the 27th parallel, a distance of 60 miles east, though very irregular; thence in a southeasterly direction 25 miles to the place of beginning, which forms an arm extending south 20 miles, varying in width from 8 to 10 miles. The county has an area of 1,953 square miles, or 1,256,000 acres.

The eastern portions of the county extend into the westerly slope of the Sierra Nevada Mountains, and the entire surface may be said to possess a rugged character, with many small and fertile valleys and gently sloping hillsides. One of the most remarkable topographical features of Tuolumne is Table Mountain, which extends for a distance of between 20 and 30 miles along the northwestern boundary.

The great mass has an almost level top, and its perpendicular sides, rising to a height of upwards of 2,000 feet above the bed of the Stanislaus River, are visible as a striking and wonderful formation from the road over which the stage passes in going to Sonora. Table Mountain was built up by a lava flow, which first filled an ancient river channel,

and continued to rise above it until the existing mass was formed. On the confines of the county, in the Sierra Nevada, are Mount Dana and Castle Peak, the former rising to a height of 13,227 feet, and the latter having nearly as great an altitude.

The rivers of the county are the Stanislaus and Tuolumne, which form tributaries to the San Joaquin. The Tuolumne has its source entirely within the limits of the county, and may be justly termed the river of a thousand lakelets, although a number of these strictly come under the head of lakes, the larger being from one half to 2 miles in length. The main or principal branch of the river flows through the Hetch Hetchy Valley, which is situated 50 miles east of the county seat. This branch, with its many tributaries, commands about three fourths of the entire watershed of the county, though its main sources are in its eastern part, and to which the many lakes in that locality give rise.

The Stanislaus River flows through the northwestern part of the county, and with one of its tributaries forms the west boundary line. From the south fork of this stream the Tuolumne County Water Company's canal receives its supply of water, which is conducted through a system of ditches, flumes, and iron pipes a distance of 20 miles, and thence through the distributing ditches and flumes to all the important points in the county, for mining, manufacturing, and irrigating purposes. The construction of this aqueduct cost, in all its details, close to half a million dollars, and the county has derived great benefit from it, more in former years than at present, as the hydraulic method of mining, in the success of which it was a vital factor, is virtually suppressed by law. Lake Elnor, the largest of the group of lakes, and which forms one of the principal sources of the Tuolumne River, is situated in a valley 4 miles long and averaging 1½ miles in width.

Tuolumne County possesses the characteristic foothill and mountain climate. At Sonora, the county seat, the summers are hot, the thermometer ranging about 95°, with occasional days when it will reach over 100°. The nights, in common with other parts of California, are always cool. The winters are cool, with occasional frosty nights and light falls of snow in the foothills. The latter, however, does not lie long, and frost is rare. The thermometer in winter sometimes, though not often, marks below 20°. As a rule the winter months are pleasant; the days, when it is not rainy, are sunny and warm, and the nights are not as a rule uncomfortably cold. In the higher mountain levels, of course, more rigid weather in the winter prevails.

The rainfall is somewhat heavier there than in the San Joaquin Valley, the record for the season of 1888-89 showing 25.92 inches, and that of 1889-90 being 63.54 inches. This season was an unusually wet one over the whole State, and extended from October to May.

The soil of Tuolumne County is characteristic of the mountains from which it has been brought down by glacial action and the action of water. It is argillaceous in character. In the lower levels there are vast deposits of black alluvium, while on the hillsides it is gravelly, and in the higher levels rocky. The soil on the hillsides, mountain slopes, and the parallel chains of small valleys along the many watercourses throughout the county is very productive. The valleys particularly produce a luxurious growth of native grasses, and, together with the rich

verdure of the gentle slopes and table-lands, furnish pasturage during the summer months for vast herds of cattle and sheep.

The water supply of Tuolumne County is ample for all requirements. Water is used there both for mining and irrigation, and is furnished by a system of dams, reservoirs, and canals owned by the Tuolumne County Water Company. The main canal of this company runs from the south fork of the Stanislaus River, from a point about 18 miles above Columbia, and extends to that town and its vicinity. This canal as originally constructed is 7 feet wide on the bottom and 13 feet deep, with an average grade of 16 feet to the mile. The main flume at the head is 7½ feet wide and 2 feet deep. This carries in the summer season 2,100 miner's inches. There are three timber dams, all on the south fork of the Stanislaus River. The lowest one is at Strawberry Flat, from 13 to 15 miles by way of the river from the head of the ditch, and about 31 miles from Columbia. A mile above is the Upper Strawberry, or second reservoir, and about 10 miles above the lower reservoir is the Big Dam. The entire capacity of the three reservoirs is equal to something over two months' supply. All these are what is known as Cob-work Dam.

About 6 miles from the head of the main canal is a lateral ditch with a capacity of 500 inches. This is 9 miles in length, and supplies the Consolidated Eureka Mine at Summersville. From this branch another ditch, beginning almost a mile below Confidence, conveys the water between 3 and 4 miles to Soulsbyville. A branch ditch from the end of the main canal runs to Bald Mountain, with a carrying capacity of 300 inches. From Columbia a branch takes up the second headwater from that district, carrying it to Jamestown, Montezuma, and the surrounding country. The same is done at Soulsbyville, where a branch takes the second headwater from the mills, runs to the lower Phoenix reservoir and connects with the ditch that supplies Sonora. From Dead Horse Mine the second headwater is carried in a branch extending towards Algerine.

There is one large tunnel on the line which runs from the south fork to the main Stanislaus River. It is considerably over a mile in length, and the cost of cutting it was about a quarter of a million dollars. A very considerable quantity of pipe was necessary in different portions of the line, amounting in the aggregate to about 7 miles. In addition to the main canals described there are many miles of distributing canals and ditches.

IRRIGATING WORKS IN TUOLUMNE COUNTY.

Name.	Miles.	Assessed Value.
Tuolumne Water Co. ditches	85	\$38,250
La Grange Co. ditches	13	20,000
P. B. Smith ditches	4	1,000
O. P. Gale ditches	35	12,000
Gold Rock Water Co.		1,500
Golden Gate Water Co.		21,850
Sundry small ditches		425
Totals	137	\$95,025

Fruit raising, to which the soil is admirably adapted, is one of the growing interests of the county. Semi-tropical fruits of every variety,

and vines are cultivated, and yield an abundance of highly flavored fruit. The almond and walnut are quite extensively cultivated, and with encouraging results. Among the vines the Muscat, or raisin grape, is coming into favor with our viculturists. They yield largely, and the fruit is of an extraordinary size. This branch of industry, the raising of fruit, will at no distant day stand first of the productions of the soil. There is a diversified system of farming carried on, which, in every particular, proves profitable. There being but a small part of the arable lands under cultivation, the farm products are therefore equal only to the demand for home consumption.

Far out around the town of Sonora, over the hilltops and in the valleys, stretch the orchards of peaches, apricots, pears, plums, apples, cherries, and other kinds of fruit. Peach trees are cultivated more than other kinds, and they produce as fine flavored and large peaches as can be found anywhere else in the State.

The vineyards are important in horticultural interests. The grapes are unexcelled when of the best variety; large quantities are shipped, while the poorer kinds are made into wine. The situation of the town is especially adapted to vineyards, since in some parts there are advantages of water and sunny slopes unsurpassed.

Citrus fruits are not cultivated to any great extent, although orange trees flourish, bearing at the age of five to eight years, and produce sweet, highly flavored fruit. It is thought that oranges might be quite extensively and profitably raised by those who have gardens in favored positions, sheltered from the frosts and winds.

Almond trees thrive and produce a good crop of nuts. In the early spring from hundreds of gardens in the vicinity glow the snowy almond trees, showing their great number and fruitfulness. Walnuts are also raised.

Around Jamestown the fruits chiefly grown are grapes and peaches. They are scarcely ever known to fail, and attain great perfection. In table grapes the Sweetwater, Black Ferrara, White Muscat, Flame Tokay, Black Hamburg, and Black Prince do well. All kinds of apples grow well in this district, and their flavor and appearance are equal to those of any part of the State, excepting some grown at much higher altitudes, such as the mountains above Sonora, but the crop is more sure here than in that locality. No part of the world is better adapted to the cultivation of the peach than this. This has been proved time and again. All kinds do well, from the Early May to the latest known variety. Pears do equally well with the apple and peach. All varieties of cherries do remarkably well. The plum does well and is a very sure crop; scarcely any disease ever attacks this tree, and the same is true of the prune. This district appears to be the natural home of the fig. All known varieties do well, and there are trees the bodies of which are 11 feet in circumference.

Tuolumne County is not very largely devoted to fruit growing. The principal sections in which fruit is raised are Sonora, Columbia, Tutletown, and Jamestown, and the varieties, in order of preference, are: apples, pears, peaches, plums, nectarines, apricots, figs, walnuts, almonds, with some persimmons, oranges, and cherries. These are usually disposed of green; a small amount is dried, very little being canned, the little that is being put up for domestic use. But little fruit is exported from this county, that which finds its way into the

outside world being generally dried. Some small amount of green fruit of extra fine quality is shipped out of the mountains to San Francisco.

One of the largest orchards in this county is that of McComber Bros., who have some 50 acres in fruit, principally apples, at Sonora. In connection with their orchard these gentlemen have a large establishment for the manufacture of cider and vinegar, in the making of which they consume the entire output of their own orchard and purchase large quantities from the local growers. The products of their establishment find a ready sale among the miners of Tuolumne County, and also in San Francisco and Oakland. Apples were sold in Sonora last season at from \$10 to \$20 per ton; for loose fruit, 2 to 5 cents per pound. Green apples delivered at McComber's Cider and Vinegar Works during the present season were purchased at from \$10 to \$20 per ton, according to quality.

The difference in elevation in the various parts of Tuolumne County makes a great difference in the varieties of fruit which are grown there, and affords a wide range in those varieties, from the fig, the olive, and in some cases the orange, which are found in the lower levels, to the apple, which attains perfection in the higher levels.

Some of the orchards in this county date back to the days of the gold excitement, and are contemporaneous with the history of the county. That of McComber Bros. was planted by the present owners in 1852. Jarvis Corveron planted an orchard in 1852, Mr. Haslan set an orchard in 1854, and the Comstock orchard was planted in 1855. Most of these are still in existence and bearing. The trees planted by McComber Bros. were imported from Oregon, and cost them \$2 50 each.

ACREAGE AND VARIETY OF FRUITS IN TUOLUMNE COUNTY.

Variety.	Acres in Trees.			
	Bearing.	Non-Bearing.	Total.	Plant of 1892.
Apple	200	68	268	5
Apricot	20	7	27	2
Cherry	25	3	28	1
Fig	12	6	18	2
Olive		2	2	
Peach	90	7	97	3
Nectarine		1	1	
Prune	3	1	4	
Pear	58	10	68	3
Plum	3	2	5	1
Quince		2	2	
Lemon		2	2	1
Orange	1	4	5	2
Nuts—Almond	3	5	8	1
Walnut	7	6	13	2
Raisins	50		50	
Table grapes	25		25	
Small fruits	22	10	32	8
Totals	519	136	655	31

VENTURA COUNTY.

Ventura County is located between the Mohave Desert on the east and the ocean on the west, and between the counties of Los Angeles and Santa Barbara. It is bounded on the north by Kern and San Luis Obispo Counties, on the west by Santa Barbara, on the east by Los Angeles, and on the south by the Pacific Ocean. It has an area of 1,628 square miles, or 1,296,000 acres. Of this nearly 1,500 square miles are mountain and desert, valuable chiefly for their mineral products. The arable area, however, is considerable in extent, much of that regarded as desert being very fertile under water, while through the mountains are found numerous little valleys. These valleys are of every shape and extent: from the broad expanse with square miles of level land to the little pocket among the hills. The principal of these is the Santa Clara. This valley extends nearly east and west across the county, and is traversed by the Santa Clara River fed by numerous tributaries, as the Castis, Piru, Sespe, and Santa Paula. The average width of the valley is 10 miles, and immense ranches extend from one end to the other. At the upper or east end is the Camulos, with its orange and olive orchards, wine cellars, and old vineyards, made famous by Mrs. Jackson, who here wrote a part of her celebrated book, "Ramona." This beautiful valley, surrounded by "high sierras," was mentioned by Cabrillo but half a century after Columbus discovered America. Senator Sherman, of Ohio, in his recent visit to this place, said that this broad valley, with its surrounding mountains and its clear, blue sky, forcibly reminded him of Italy, but that this was on a much grander scale.

Next in importance comes the Ojai Valley, a great amphitheater, whose walls are mountains rising like citadels in all directions. Overlooking the whole is Mount Topo-topa, rising to a height of 6,000 feet. This basin is well timbered and has a very productive soil, giving the largest wheat yield per acre in the county. The Ojai Valley as a whole will attract, and that at no very distant day, hundreds of people who will engage in the raising of citrus fruits.

Other valleys are the Conejo, 1,000 feet up on the northern slope of the Guadalupe Mountains, well watered and admirably adapted for raising grain; the Simi, with its splendid oak forests and grazing lands; the Santa Ana, with its cultivated farms and orchards, its trout streams, and clumps of rhododendrons; the Las Posas, with its immense wheat fields and semi-tropic fruits; the Sespe, lying along each side of the Santa Clara River and the San Buenaventura Valley, narrow but picturesque, watered by the Ventura River, and dotted with pleasant homes.

The Santa Clara River, of which mention has been made, traverses the entire length of the county from northeast to southwest. It is fed by several tributaries which rise in the mountains near the Santa Barbara line, chief of which are the Santa Paula, Sespe, and Piru, the latter having its rise in Kern County. The Ventura River rises in the San Rafael range, flowing nearly due south, and is fed by numerous springs and mountain streams. These two rivers reach the ocean but about 6 miles apart. They furnish abundant water for irrigating purposes when needed, Ventura being one of the best watered counties in Southern California, as nearly every valuable farm in the county can be reached with flowing water.

The climate of Ventura County is adapted to a great range of horticultural pursuits, and in the different parts of the county nearly all

varieties of fruit, except those of the tropics, can be produced. Near the coast the mercury seldom falls below 34°, or rises above 83°. In the valleys farther back from the ocean the weather grows hotter in the summer and cooler in the winter, the mercury sometimes reaching the freezing point in January and February, and leaving 100° behind in July and August. In the mountains snow sometimes falls in the winter months, but never visits the valleys.

The soil in the valleys is generally a rich, inexhaustible loam, varying from 10 to 150 feet in depth, and yielding enormous returns for the labor expended upon it. On the Simi rancho a variety of soil is found, which, from results obtained, seems equally well adapted to deciduous fruits, grapes, and the smaller fruits and berries. Surface water is found there at varying depths from 14 to 28 feet, while artesian water is obtained at 70 to 90 feet. At Bardsdale is found a sandy loam productively strong, working easily, and suited to all the fruits the climate will permit. The fruits that have been fully tried and proved a success are lemons, oranges, prunes, apricots, plums, peaches, figs, walnuts, and raisins, with a tendency to make a specialty of lemons.

At Fillmore City the soil is an alluvium, deep, rich, the wash of the surrounding hills, and apparently well suited to the growth of citrus fruits.

A very large portion of the arable land of Ventura County is not irrigated, but should it ever be considered necessary there is within her borders ample water for irrigating the whole extent of her cultivable land. The numerous rivers and creeks which have their source in her mountain ranges, or find their way into her borders, give ample assurance of a never-failing supply of water for all purposes. Among the principal streams, the waters of which are or can be diverted for irrigating purposes, are the Santa Clara, Ventura, Santa Paula, Sespe, Piru, and the Las Posas Rivers, all having their source in the mountains from springs of pure, clear water; there are also a number of artesian wells in the county. The town of Ventura receives its supply of water from the Ventura River.

IRRIGATING WORKS IN VENTURA COUNTY.

Name.	Miles.	Assessed Value.
Santa Ana Water Co.	3	\$11,610
Santa Paula Waterworks	2½	12,000
Sespe Land and Water Co.	3	3,000
Santa Clara Water Co.	10	1,400
Southside Improvement Co.	6	3,000
Totals	24½	\$31,010

As has been seen, Ventura County, with its varied climatic and topographical features, its soil, and abundant water, presents opportunities for a wide range of horticultural pursuits, and, as might be expected, nearly all varieties of fruit are found growing in some portion of the county. While Ventura is behind many of her sister counties in her output of fruit, it has been owing to lack of transportation facilities and want of capital, rather than inaptitude for the business. Among other fruits we find there nuts and berries, apples, pears, peaches, plums, cherries, nectarines, almonds, loquats, grapes, strawberries, blackberries,

etc., all of which thrive well, and it is peculiarly the home of the English walnut, apricot, and the prune. Some of the finest oranges and lemons which find their way to the markets are raised in the orchards of the Ojai Valley and adjacent lands; also in Santa Paula and Sespe districts.

Walnut growing is one of the specialties of Ventura County, and there the English walnut appears to reach its perfection. In speaking of the value of this crop N. B. Smith, one of the most successful horticulturists in the county, says that trees, when they become fifteen years old, and are well taken care of, are worth \$500 each. In order to be worth this amount they must pay interest on a sum equivalent to that amount, and the occasion when this is yearly realized is not at all uncommon. A gentleman well informed upon the subject mentions a case of \$60 worth of nuts being taken from a single tree in one season. Judge Poplin has several trees on his place for which he would not take \$500 each. An article is worth what it will realize in the market, and a walnut orchard is certainly no exception to that rule. The fact that there is such a small area where they can be grown makes them exceedingly valuable to Ventura County, and the time will come when a 10-acre orchard will make the owner independent.

In the country around Fillmore, a subdivision of the Sespe ranch, citrus fruit does well, and its culture gives promise of becoming a prominent industry. The soil is a rich alluvium, deep and warm, the wash of ages from the hills around. It is particularly suited to the growth of the orange and the lemon. The fruit from the groves there, that are in bearing, is as bright and sweet and richly colored as the famous products of Riverside, while the olive, raisin grape, prune, and apricot grow thriftily, and bear profuse crops of fine fruit at an unusually early age.

There is a young orange grove there only two years old, the trees in which blossomed freely last year, and this season are laden with fine oranges. A resident on the avenue reports a like success with lemons. Another tells of a crop of figs gathered twelve months after setting the trees in the orchard. Still another of grapes on his vines one year from the cutting. On one ranch are tomato vines blossoming, and on the next strawberries ripening all the winter through. Innumerable similar evidences of the fertility of the soil and equability of the climate might be quoted if space permitted.

Los Posas is a promising fruit section, and Piru City has taken rapid strides in the same line. Large quantities of English walnuts, chestnuts, lemons, limes, olives, and oranges have been planted and all show a thrifty growth.

Saticoy is highly favored by having an abundant supply of good water, easily obtained, and a soil of great fertility. Some of the best fruit orchards of the Santa Clara Valley are to be found near by. A great many English walnuts also, of the soft-shell variety, have been planted in and around the town, and are making most remarkable growth, thus showing that this is the home of the walnut.

The hills north of Saticoy are particularly adapted to olives, as is demonstrated by the grove of Mr. Harold, near by, which cannot be surpassed for its age in the State. Prunes, apricots, and pears do well, and in fact nearly all kinds of fruits. Even the citrus varieties are doing well in the cañons.

In the Ojai Valley some excellent results have followed the planting of fruit trees, and excellent peaches, prunes, apricots, pears, grapes, and other fruits are produced there; while in the upper Oaji citrus fruits do well, and the olive seems to find its home there. The latter promises to become an important industry in time, as many hundreds of acres have already been planted to the olive in the Ojai Valley.

The chief fruit-producing sections of Ventura are, as mentioned above, Santa Clara Valley, Ojai Valley, and Las Posas. The principal fruits grown there are the walnut and apricot, and for these Ventura County seems especially suited. Following these are prunes, peaches, and citrus fruits. Small fruits do well, but are not grown to any great extent.

A very large area of new fruit trees has been planted in Ventura this year. A careful estimate places it at 30 per cent of the whole.

The crop of the present season is very good, Ventura County having suffered but little from the late season. Apricots were full and walnuts more than average, while other fruits made at least an average crop. Prices this season ruled high, apricots selling at \$18 to \$25 per ton. The principal markets for fruit from this county are San Francisco, Los Angeles, and the East, and the larger part of the output is marketed dried or canned.

At Santa Paula, N. W. Blanchard has one of the finest lemon orchards in the State, and this fruit does well there and returns large profits to the grower. There are also some extensive olive orchards, which do equally well with the lemon.

ACREAGE AND VARIETY OF FRUITS IN VENTURA COUNTY.

Variety.	Acres in Trees.			
	Bearing.	Non-Bearing.	Total.	Plant of 1892.
Apple	92	210	302	56
Apricot	825	232	1,057	92
Cherry	8	17	25	
Fig	35	27	62	11
Olive	47	566	613	208
Peach	113	105	218	44
Nectarine	5	11	16	
Prune	379	464	843	110
Pear	58	159	217	43
Lemon	237	206	443	67
Orange	220	328	548	104
Nuts—Almond	25	125	150	28
Walnut	997	5,308	6,305	900
Raisins	287		287	
Table grapes	69		69	
Totals	3,397	7,758	11,155	1,663

YOLO COUNTY.

Yolo County lies almost within the heart of the Sacramento Valley, on the west of the Sacramento River, which bounds its eastern border. On the north it is bounded by Colusa, on the west by Lake and Napa, and on the south by Solano County. It has an area of 1,018 square miles, or 650,000 acres.

The greater portion of its area is a level surface, but toward the west

rise hills, which are interspersed with cañons and valleys of considerable extent. About 40,000 acres are tule lands, and but little waste land is found in the county. Cache Creek and Putah Creek are the two principal streams in the county. These rise in the mountains on the west and flow toward the Sacramento River. Cache Creek has its source in Clear Lake, in Lake County, and Putah Creek rises in the mountains of Napa County, and for part of its course forms the southern boundary of Yolo County. Although each of these streams is of considerable size when it first enters the county, they are both lost before reaching the Sacramento River. During the winter months both of these creeks are torrents, cutting their way, before reaching the Sacramento Valley, through precipitous cañons, carrying down bowlders, sand, and cobblestones to the valley below. These streams debouch into the valley at Capay and a few miles west of Winters, where the grade lessens. Putah Creek enters the valley from amid rolling hills, and the formations of shale, sandstone, and conglomerate in the neighborhood of Winters give place to clay and sand. At Capay, where Cache Creek enters the valley, its banks are composed of clay and gravelly strata; from there it flows through a flat country, sloping gradually to the southeast. A short distance east of Capay the creek widens, and its banks are only 4 or 5 feet high, while lower down, towards Madison Bridge, the stream is again confined between higher banks. The shifting waters of these streams have formed a bed of sand and gravel throughout the intervening country, which is now covered with soil. This gravel forms a water plane, which appears to slope to the southeast with a grade of about two and a half times that of the surface.

In climate Yolo varies little from other portions of the Sacramento Valley. During the summer months there is the usual hot weather, the mercury frequently reaching the 100° mark or over. Frosts sometimes occur in the early winter months, but are rarely severe, and the damage done by them is not usually great. In the Capay Valley the climate is mild, pleasant, and agreeable in winter, fall, and spring. The thermometer seldom falls below 40° above zero; occasionally there are a few mornings when it marks some degrees colder. There are hot waves, or spells, during the summer, when the thermometer reaches 100° and upwards for a few days at a time, but they are succeeded by milder days, and the nights are always cool and pleasant, with an almost entire absence of dews, so that these summer months are unsurpassed for fruit-drying, making it unnecessary to have expensive driers and evaporators. The air is pure, clear, and light, with but few foggy days. The climate is one of the best for pulmonary complaints; in fact, it would be difficult for one to die of consumption in that locality.

The following table gives the mean average temperature of each month of the year 1891 in various parts of Yolo County:

Place.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April.	May.	June.
Davisville	74.4	74.1	70.6	69.0	55.5	49.0	43.4	50.7	53.1	65.1	66.8	69.9
Knights Ld'g	73.7	72.8	67.5	65.7	56.8	46.3	41.3	50.5	51.0	60.3	66.3	67.2
Dunnigan	79.3	77.8	73.5	67.9	56.8	48.8	45.0	57.2	61.8	71.5	73.1	79.0
Woodland	82.8	78.6	77.1	78.1	68.1	51.9	43.2	46.1	48.1	51.7	62.5	67.3

Mean—Davisville, 61; Knights Landing, 60; Dunnigan, 66.4; Woodland, 63.5.

The monthly rainfall for nineteen years, from 1873 to 1891, inclusive, at Woodland, is given in the appended table:

Year.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Total for Year.
1873	1.25	2.84	.56	.18	none	none	none	none	none	.20	1.15	10.44	16.62
1874	5.99	1.33	2.85	.64	.40	none	none	none	none	3.26	2.79	.16	17.42
1875	5.22	.35	.66	none	.15	1.59	none	none	none	.44	3.87	2.49	14.77
1876	4.40	4.85	4.24	1.40	.45	none	.16	none	.17	3.37	.27	none	19.31
1877	3.95	1.42	.77	.03	.53	none	none	none	none	.94	1.10	1.29	10.03
1878	11.52	7.61	2.30	1.25	.60	none	none	none	.25	.34	.88	.01	24.84
1879	2.62	3.25	4.48	2.40	1.70	none	none	none	none	.22	7.15	3.66	20.48
1880	1.33	1.22	.97	6.84	.28	none	none	none	none	none	.73	19.37	
1881	4.50	1.93	.97	1.39	none	.35	none	none	.50	.25	1.87	2.37	14.13
1882	1.24	1.87	2.34	1.51	.03	.07	none	none	.82	2.04	2.42	1.05	13.39
1883	.91	.60	3.24	1.22	4.65	none	none	none	.54	1.04	.30	.54	13.04
1884	3.67	4.07	6.53	4.03	none	3.02	none	none	.22	1.61	none	5.57	27.73
1885	1.62	.15	.15	1.50	none	none	none	none	.06	.05	9.14	2.73	15.40
1886	5.18	none	1.71	4.14	none	none	none	none	none	.59	none	1.39	13.64
1887	.88	7.56	.75	1.90	none	none	none	none	none	none	.60	3.67	15.36
1888	3.88	.97	2.80	.10	.77	none	none	none	.56	none	6.25	4.51	19.84
1889	.19	.49	5.09	.85	2.01	.43	none	none	none	5.54	3.54	8.16	27.10
1890	5.30	4.37	3.42	.95	1.68	none	none	none	.42	none	none	2.13	12.78
1891	.57	8.73	.62	1.53	.72	.12	none	none	none	none	.28	1.15	13.72
Sums.	64.85	53.61	45.25	31.86	14.05	4.59	.16	none	3.54	19.89	36.61	60.05	324.60
Avg's.	3.413	2.821	2.381	1.677	.739	.241	.084	none	.191	1.046	1.926	3.160	17.084

Season.	Total for Season.
1872-73	10.22
1873-74	23.00
1874-75	14.18
1875-76	22.30
1876-77	10.51
1877-78	26.69
1878-79	16.23
1879-80	16.50
1880-81	17.87
1881-82	12.25
1882-83	16.75
1883-84	22.75
1884-85	10.82
1885-86	23.64
1886-87	13.07
1887-88	12.79
1888-89	21.16
1889-90	30.98
1890-91	14.84
Sums.	327.70
Average	17.247

It will be seen that the average rainfall is about 17 $\frac{1}{4}$ inches per year; rather above the general average for the State.

The soil of Yolo County is generally a rich, sandy loam, in many places 25 feet in depth. The surface soil throughout is principally a clayey loam, varying in places to sand or adobe, accordingly as the streams, which have influenced its quality, have borne an excess of either sandy or alluvial material from the neighboring mountains. Close to the western foothills the soil becomes frequently of a more gravelly nature, while upon the eastern side of the county, throughout the "tule" lands, which form the approach to the Sacramento River, the soil is more clayey, and usually gives place to "adobe."

Immediately along the western bank of the Sacramento there is a strip of land, averaging from half a mile to a mile in width, the superficial strata of which are formed of sedimentary deposits from the river. This land is remarkable for its fertility and facility of cultivation. There is also a large area in the eastern portion of the county, which is subject to overflow every two or three years by the Sacramento River, which leaves behind a deposit of very fertile soil.

In regard to Yolo's irrigation system, some time since Assistant State Engineer Schuyler made an official report, which embodied the following facts:

"Cache Creek is the outlet of Clear Lake, which receives the drainage of 420 square miles of the Coast Range, the total watershed of the creek being 1,024 square miles. The lake has a length of 23 miles, a maximum width of 8 miles, and a total area of about 51,000 acres. Its elevation above sea-level is 1,300 feet. It forms a catchment basin or a receiving basin, serving to lessen the volume of the floods of Cache Creek, which otherwise would pour down its steep slope with devastating force into the valley below.

"At flood stages, which are caused solely by winter rainfalls, the discharge of Cache Creek reaches a volume of 30,000 to 35,000 cubic feet per second. During the spring and summer the surplus waters of the lake gradually pass off, and the minimum discharge is found in October, when it is sometimes as low as 40 cubic feet per second. From Clear Lake, Cache Creek passes down a rocky cañon for 30 miles, with an average inclination of 28 to 30 feet per mile. Reaching Capay Valley it broadens, and its meanderings through that beautiful valley measure 28 miles, with a fall of 267 feet, or about 9 $\frac{1}{4}$ feet per mile. In its farther course across Yolo County, until it loses itself in the tules of the Sacramento River, the creek has a fall of from 4 to 6 feet per mile.

"The first irrigation canal taken out of Cache Creek was constructed by James Moore, in 1856. It heads 8 miles above Woodland, and was originally 8 feet wide on the bottom and 6 to 8 feet deep. In 1863 it was enlarged to a bottom width of 16 feet, at which it still remains, although its depth has been considerably diminished. The capacity of the ditch has been estimated at 400 cubic feet per second; but in its present condition it will probably not carry one fourth of that amount. Its original cost was \$10,000, but protracted litigation in defense of the water right has swelled the estimated total cost to \$50,000. The area irrigated by the ditch is from 12,000 to 15,000 acres, most of which is devoted to alfalfa. The main branches and distributing ditches are owned by the irrigators by whom they were constructed. The main branch lines, of which there are five, are owned by incorporated companies, the stockholders in each being those using water from the ditch in which they are interested. These branches have a capacity of from 10 to 40 cubic feet per second. The dam by which water is converted into the canal is a temporary structure, made of brush and gravel. The first freshet in the fall sweeps it away, and when the water recedes the canal cannot get its supply until the dam is renewed, which does not occur until the low water in the summer. In 1877 the dam was completed April 16th; in 1878, August 1st, and in 1879, July 25th. All the earlier part of the season, therefore, before the completion of the dam, the irrigators are obliged to do without water at a time it is most needed. The revenues of the canal were considerably over \$5,000 in 1878,

and over \$7,000 in 1877, and as the expenses are light, consisting only of the yearly renewal of the dam, and the salary of a zanjero during the irrigating season, the property is a valuable one. The yearly cost of renewing the dam is from \$500 to \$2,500, the greater cost occurring when the work is done in the spring months before the water has subsided. With a permanent dam, and the assurance of a constant supply of water when needed, the area irrigated would be much greater, as alfalfa is found to be a very profitable crop, and water is in general demand. So great is the demand, in fact, that the irrigators, it is reported, frequently volunteer to replace the dam in the spring when they most require water, at their own expense; but the owner prefers to manage it in his own way and takes his own time."

IRRIGATING WORKS IN YOLO COUNTY.

Name.	Miles.	Value.
Moore's irrigating ditches	50	\$20,000
Clear Lake irrigating ditches	10	1,000
Capay irrigating ditches	10	1,000
Adams irrigating ditches	20	2,000
Totals	90	\$24,000

Yolo holds an enviable position among the horticultural counties of the State, for while she has as yet no great extent of land devoted to any one fruit, sufficient has been done to prove that in soil, climate, and topographical conditions she is adapted to the production of a large range of varieties, and will in time take rank as one of the leading horticultural counties of Central California. The output of fruit grows larger every year, and the area devoted to orchards and vineyards receives constant accessions. Enormous quantities of fruit are shipped annually through the Buckeye Grangers Warehouse Association; over 3,000,000 pounds, or 141 carloads, of various deciduous fruits were shipped through that association in the year 1891.

The apricot thrives well there, especially in the sandy soil, and reaches perfection along the river banks and in the valleys of the Coast Range. The peach is a standard fruit, and it reaches a perfection attained in few other localities, the fruit being large, luscious, and finely flavored. Prunes are extensively planted and do well. The pear, especially the Bartlett, is very widely grown and generally does well. Figs grow luxuriantly, bear in every part of the valleys and foothills, and thrive with the least possible attention. Several thousand acres of land are planted to vines of different varieties, raisin, wine, and table grapes being produced in large quantities. Yolo was the pioneer of the raisin industry in California. Her most extensive raisin vineyards are located near Woodland, but the first experiments were made near Winters in 1869, on 240 acres. Other fields were planted until the owner, R. B. Blowers, now has 1,200 acres in vines. In the Capay Valley very extensive planting has been done in the past year or two, especially by the Western Coöperative Colonization and Improvement Company.

The fruits set out are mostly of the standard varieties—peaches, apricots, Bartlett pears, prunes, figs, raisin grapes, etc., while along both sides of the avenues throughout the tract walnuts will throw their

grateful shade. A considerable number of citrus trees are also being set out, quite sufficient in number to demonstrate that these fruits can be successfully grown in the valley, about which the colonists appear to have no doubt, provided proper care is given to the young trees. Up to March 24, 1892, the company has sold about 3,000 acres of land. Of this amount more than 1,700 acres have been planted to trees. On the 1st of January, by actual ascertainment, 136,000 trees had been planted. This does not include many thousands of trees planted on land purchased from private individuals. On land sold by the company, it is expected that 400 acres of orchard will come into bearing this season.

The sections of Yolo County which are chiefly devoted to fruit are Putah Creek, and the country aligning the Sacramento River from Davisville to the northern part of the county, and the favorite fruits are grapes, apricots, prunes, almonds, figs, pears, apples, cherries, and the small fruits in order. The markets for Yolo's products are found in Sacramento, and in the Sacramento and Marysville canneries, San Francisco, and the East. A great deal of the fruit is shipped in its green condition to the East. Green fruit is packed in boxes of 20 to 40 pounds each, the pears being packed singly, and wrapped, in 40-pound boxes. Almonds are shipped in sacks of 40 pounds each, raisins in sacks and boxes, dried fruit in sacks, and that which is shipped to the canneries is packed in open boxes. The output for the season of 1891 in Davisville and vicinity was:

Raisins	250,000 pounds.
Almonds	20 tons.
Table grapes	15,000 crates.
Dried fruit	2,000 sacks.
Pears	30,000 boxes.
Plums and peaches	5,000 boxes.

Prices for 1891 ruled low, as they did elsewhere. This year there has been a very material advance, as will be seen by the following comparative table:

	1891.	1892.
Pears	1½ to 1¾ cts.	2 to 3 cts.
Peaches	1½ cts.	1½ to 2 cts.
Plums	1 ct.	
Prunes	1 ct.	1½ cts.
Apricots	1¼ cts.	2 cts.
Almonds	10 to 12½ cts.	12 cts.
Raisin grapes	\$22.50 per ton	

The yield of fruit from Yolo County has been reported as follows: Peaches will average one half crop, apricots one half crop, grapes two thirds crop, while pears, plums, prunes, and almonds are reported as average.

A very considerable area of new land has been set to fruit in this county during the present season, comprising about 25 per cent of the whole.

ACREAGE AND VARIETY OF FRUITS IN YOLO COUNTY.

Variety.	Acres in Trees.			
	Bearing.	Non-Bearing.	Total.	Plant of 1892.
Apple	20	5	25	1
Apricot	450	374	824	71
Cherry	18	7	25	2
Fig	58	10	68	4
Olive	12	11	23	4
Peach	620	420	1,040	107
Prune	730	792	1,522	161
Pear	410	211	621	53
Plum	5	10	15	3
Orange		5	5	
Nuts—Almond	160	339	499	121
Raisins	5,500		5,500	
Table grapes	1,500		1,500	
Totals	9,483	2,184	11,667	527

YUBA COUNTY.

Yuba County derives its name from the Yuba River, which flows along its southern border, and is bounded on the north by Butte County, south by Placer, east by Nevada and Sierra, and west by Sutter County. Its average length in a northeasterly direction is 60 miles, and in breadth varying from 7 to 30 miles, giving it a superficial area of 617 square miles, or 440,000 acres. Yuba County very much resembles Sutter County. They are neighboring counties, and the physical characteristics of the one, with a single great exception, have their counterpart in the other. The exception is that while Sutter is entirely in the plains, Yuba runs up into the Sierra, a fact which alters completely Yuba's place in the economy of the State.

Yuba County occupies a position in the heart of the Sacramento Valley. That part embraced in the angles formed by the junction of the Yuba and Bear with the Feather River, is level and well supplied with small streams. The foothill region, which reaches from the valley eastward, is at first rolling, but becomes hilly, brushy, and rocky as the Sierra Nevada Mountains are approached. The northeastern portion is rugged and broken. The land is divided about as follows, between valley, foothill, and mountain: The area of the county is 440,000 acres—valley land, 105,000 acres; foothill land, 136,000 acres; mountain, 199,000.

In the valley the wet and dry seasons are very distinctly marked, the fog seldom appearing. The temperature during the day is usually high, but is cooled by the strong winds which constantly blow through the valley from the ocean on the south, and from the north by the cool air oozing down from the snow on the summit of the mountains of Siskiyou and Shasta. In summer there are a few warm days, but the evenings and mornings are invariably cool. The seasons also touch extremes which the coast belts never experience, the winter being 4° colder and the summer from 16° to 20° warmer. The thermometer during summer ranges from 76° to 90°, and in some instances reaches as high as 100° or over; but so dry is the heat that a long and hard day's work may be done in the open air without the laborer feeling any inconvenience or exhaustion.

The valley lands of the county are deep and rich, and of an alluvial character, entirely free from rock and stones. The valley and foothill lands are, in general, well adapted to fruit growing, and of late years there has been a steady advance of the horticultural industries there, especially along the Feather River.

The lands in the valley, or western half of Yuba, are mostly used for the growing of grain, though most of the farmers owning large tracts have small orchards. On the east bank of the Feather River in Yuba County, where there is much rich bottom land, there are now several large orchards and vineyards which are as fine as any to be found in California. In this vicinity alone over 1,000 acres have been planted to fruit the past spring. The soil of the county is divided into three general classes—foothills, plains, and river bottom. The foothill land is peculiarly adapted to growing fruits. Up to a short time ago the foothill lands of this county were regarded by the settlers as almost valueless, but the success of fruit growing on that class of land in adjoining counties, and the adaptability of the produce for long shipment, gave immediate value to them, and to-day lands are held at \$100 per acre, and upwards, which twenty years ago would not have brought more than \$1. The lands on the plains are devoted principally to cereals, and there has been no failure of crop with them during the past twenty years. On this land the vine and fruit trees flourish without irrigation; however, the land could easily be irrigated, and soon will be, by means of ditches, a number of which are now in course of construction. The river lands are the best and most productive, fruit, grain, and vegetables being raised in abundance, and the income per acre is far above the general average. There is very little land in the county that cannot be cultivated to great advantage, either in grain or fruit.

There is a lavish water supply in Yuba County. There are three rivers—the Feather, Yuba, and Bear—bordering and passing through this county; each of these has numerous tributaries. Yuba was in early days one of the principal mining counties of California, and there is now a perfect network of old mining ditches which can be used for irrigating purposes. These ditches, with their tributaries, aggregate hundreds of miles. Their owners have extended many of these from the foothills to the plains below, and it is believed that these old mining ditches have sufficient capacity to carry water enough to irrigate all the arable land of Yuba County.

Among the most important irrigation enterprise in the county has been the organization of the Browns Valley Irrigation District, under the Wright Act. This district was organized in October, 1888, and comprises 44,000 acres of the choicest foothill land of California, consisting of sunny slopes and fertile valleys, upon which grow, with luxuriance, every variety of citrus and deciduous fruits, berries of every kind, alfalfa, grasses, and vegetables, wherever the life-giving water is applied.

This district lies between the Yuba River, which forms the southern boundary, and the Honcut Creek, which forms its northern boundary, the western boundary skirting along the foothills 11 miles east of the city of Marysville. The land has been heretofore chiefly used for stock raising and the production of hay and grain, owing to a lack of water; but the few spots in the district where water could be had in the past show the nature and productiveness of the soil and climate to great

advantage. The bonded indebtedness of the district is \$110,000, or \$2 50 per acre. The water supply is more than bountiful, as at the lowest stage of the North Yuba River at least 25,000 miner's inches run by after the headgates of the district are full.

The district has been actively at work pushing its elaborate system of irrigation works. In 1890 the district purchased 22 miles of distributing ditches from the South Feather Water and Union Mining Company, and built 18 miles of main canal, consisting of excavating and rock-wall work, and 1 mile of fluming, besides a suspension bridge 110 feet high across a gorge in Dry Creek, over which a large pipe extending 1,600 feet was also constructed, carrying the water up on to the grade with the main distributing canal, and constructed a heavy headdam 25 feet high and 140 feet long, with a 40-foot base, across the North Yuba River. The dam was constructed of peeled logs, notched and drift-bolted into each other, and all securely bolted, with bolts soldered deep into the solid rock sides and bottom of the river at every available point, with all cribs filled in with heavy rock blasted from the mountain. The dam is to have elaborately constructed gates to let the water into the flumes, which are 7 feet above the high-water mark.

There are few places in Yuba County where fruit may not be profitably raised. Every kind of fruit does well there; all the small fruits are very productive and well repay the labor bestowed upon them. In the valleys and foothills grapevines flourish to perfection. Citrus fruits do well in some parts of the county, and the olive does well in most parts. Fig trees of a mammoth size grow there. In commenting upon the advance made by Yuba County in horticulture, the Marysville "Democrat" says:

"Thirty years ago few orange trees had been planted in this vicinity, and they were put in the ground as experiments and for shade trees. Each year demonstrated that this was the home of the orange as well as the fig and other tropical fruits, and when the trees began to bear, and the beautiful golden fruit ripened, the sight was so pleasing that many citizens who had not yet put in any commenced to plant the orange tree, and in ten years they were to be found in more than one hundred different places in this city. Gradually, year after year, the planting continued, and not only the orange, but the lemon, lime, pomelo, loquat, persimmon, olive, and many others, until 1887, when an inventory was taken at the request of the Citrus Committee, by E. E. Meek, who went from place to place and made an actual count of all varieties and kinds then growing, and with the following result: He ascertained that there were then 186 residences where bearing orange trees were growing, ranging in number from 4 to 100 each, in all 1,881 trees. There were also 76 of them who had bearing lemon trees, in all 219. Seven who had limes, 6 who had citron, 28 who had pomegranates, 32 who had persimmons, 8 who had olives, and 34 who had loquat trees, making a total of bearing trees of all kinds named of 2,818. There were also of young trees not yet bearing fruit, 36,820 oranges, 4,634 lemons, 420 limes, 68 citron, 361 persimmons, 216 olives, and 186 loquat trees, making a total of growing trees of these varieties of 45,423. There were also large numbers of almonds, English walnuts, chestnut, and other nut-bearing trees.

"In a further investigation by the committee, extending outside of the city, they found over 300 bearing orange trees, and about 9,000 bear-

ing almond trees. From these trees the committee had gathered and sent to the citrus fair, held in Sacramento that winter, over 5,000 pounds of fruit, and this county was awarded premiums, including Mrs. M. Karr, who received a magnificent premium offered by the Southern Pacific Railroad Company for the best individual exhibit. The fruit that came from the foothills at Browns Valley, Smartsville, and other places, was of the finest quality and free from scale or disease, and was conceded to be colored better, and in general more perfect than much of that grown in the valley. Since that time the business of orange growing has advanced rapidly, and now there is to be found quantities of that beautiful fruit for sale by many of the growers in this city and vicinity, and at the close of the late citrus fair a car-load or more was sent to an Eastern market. Smartsville had nearly enough to fill a car. A few years ago the whole business was one of pleasure and not profit, but now it is a remunerative, and at the same time a pleasant occupation.

"The stoppage of hydraulic mining has induced many to turn their attention to fruit growing, particularly in the way of orange culture, and the groves at Smartsville, Colmena, and Marysville are indicative of the fact that Yuba County can successfully compete with her southern sisters."

While the many old and vigorous orange trees in the Marysville district are the best of evidence of the existence of favorable conditions for the culture of citrus fruits, the planting of orange orchards, as a business, began but a few years ago. The attention of the people had previously been devoted almost exclusively to the production of grain and deciduous fruits. But with the opening of the first citrus fair at Sacramento in January, 1886, popular interest in orange growing was awakened in Northern California, and this interest has since increased from year to year. Within the past three years several thousand acres north of Sacramento have been planted with orange trees, and the orange planting during the present season bids fair to be very extensive. One of the largest orange orchards in the State, covering 100 acres of ground, was set out two years ago at Colmena, in the open valley of the Sacramento, 6 miles south of Marysville, and the trees have made an excellent growth since that time, with no injury from frost.

The Marysville cannery, located on the corner of E and Tenth Streets, is one of the flourishing institutions of Marysville. During the season the cannery employs some 450 hands, and pays out annually an average of \$50,000 for wages. The plant, although the buildings are not of an imposing style of architecture, now covers, including the drying houses and tracks, about 5 acres of ground.

The Marysville cannery was established in 1888 by Mr. R. W. Skinner, a man possessed of considerable skill and wide experience in the handling of choice fruits and in the management of extensive business affairs. The high standard adopted by Mr. Skinner in the selection and preparation of the apricots, plums, peaches, and Bartlett pears, which are the popular brands, and of the various other kinds of fruits, vegetables, and berries grown in Northern California, has won for the Marysville cannery the highest praise throughout the United States.

In order to emphasize the importance of Marysville to the industry built up by Mr. Skinner and associates, the appended statistics will be of value:

During the season of 1891 about 350 cars of all kinds of fruits were received and unloaded at the Marysville cannery. This, together with that brought by team, was packed into a million quart cans, weighing about 2,000 tons. To fill the interstices in this million cans 150,000 gallons of syrup were used, to make which about 9 carloads of sugar were bought. It took 12 tons of solder and 2,000 gallons of gasoline to seal the cans.

From these general statistics one can form an idea of the enormous amount of labor required to pack, cook, test, pile, and label the product of the Marysville cannery. In the warehouse one walks through lanes and tunnels which open through the large piles, towering to the roof, of cases and cans awaiting shipment. The business of the cannery is constantly increasing, and the season of 1891 will show a quarter larger pack than 1890.

As the young orchards come into bearing the capacity of the cannery is enlarged, to keep pace with the progress of fruit culture. In the yards, where drying is done, 90 tons of apricots and 150 tons of peaches were prepared for market.

One of the products of the Marysville cannery, which other similar concerns have not produced as yet, is vinegar. In the dry yards a series of vats and presses are arranged. Here all the fruit peelings of the cannery are brought and pressed by immense screw presses, the juice being conveyed into barrels, where it is allowed to ferment and form a superior quality of vinegar. The product of the vinegar vats for the season of 1891 will be about 1,000 barrels. The peelings, after being pressed, are left in the form of a big, round cake, which are sold to the orchardists for fertilizing purposes. The pits of the various fruits, peaches especially, are carefully saved and sold to nurserymen for propagating nursery stocks.

Thus the system of the Marysville cannery is complete in every particular, and their market is the world; orders for its products coming from points as far distant as London and South America.

The chief fruit sections of Yuba County are Colmena, on the Feather River, and in the vicinity of Marysville, and the fruits chiefly produced there are peaches, pears, apricots, prunes, cherries, plums, and oranges. The markets for these are found in the East, in the Marysville cannery, and in San Francisco. The fruits shipped to the East are boxed and shipped green. There is a very large output of dried and canned fruit from this county. The output of the different kinds of fruit for the past two seasons is given below:

	1891—lbs.	1892—lbs.
Apples.....	459,700	472,000
Apricots.....	360,000	290,000
Cherries.....	152,000	175,000
Figs.....	76,500	72,000
Olives.....	2,500	2,000
Peaches.....	525,900	610,700
Pears.....	629,900	692,300
Prunes.....	300,600	210,000
Oranges.....	102,900	130,000
Nuts—Almonds.....	12,000	13,000
Walnuts.....	10,500	8,600
Raisin grapes.....	916,800	1,100,300
Table grapes.....	810,300	880,200
Totals.....	4,359,600	4,656,100

SCHEDULE SHOWING ACREAGE AND VARIETIES OF FRUIT GROWING IN CALIFORNIA IN 1892.

Fig.	Olive.		Peach.		Nectarine.		Prune.		Pear.		Plum.		Quince.		Lemon.		Orange.		Almond.		Wal.		
	Bearing.	Not Bearing.	Bearing.	Not Bearing.	Bearing.	Not Bearing.	Bearing.	Not Bearing.	Bearing.	Not Bearing.	Bearing.	Not Bearing.	Bearing.	Not Bearing.	Bearing.	Not Bearing.	Bearing.	Not Bearing.	Bearing.	Not Bearing.			
28 1/2	21	3	32	5	963 1/2	412 1/2	176	231	1,860 1 1/2	491 2	1,384 1	317 1 1/2	1,664 1	221	3	1	1	7	5	1,012	225	28	
8 1/2	20	14	1	7	120	223 1/2	8	18	30	184	41	30	10	23				2	12	32	3		
35	60	189	55	700	1,180	2,106			300	731	200	713	51	170		5	15	500	2,164	560	1,028	5	
7	18	8	15	105	146	194			8	61	85	25	30	20	1			1	14	30	59	12	
11	21	5	2	8	43	186			167	637	100	179					1	1	8	30	16	20	
73	24	15		160	214	213			338	316	304	295			41	37	2 1/2	1	4	3	253	224	
10	14	10	3	13	1,153	185			202	77	96	160	32	9			1	3	4	2	13	8	3
3	320	131	70	50	1,214	844	81	68	640	938	422	212	12	13			1	2	9	124	5	10	
16	13	16	4	5	200	186			50	200	60	63	7	3				12	11	70	118	30	
6	2		9		15		1		275	176	8		9		1							3	
15	56	25	1	30	82	28			47	25	12	26									2	1	
35	12	13	1	53	662	417			369	547	65	250				1	2	8	18	39	128	30	
					140	70			160	278	54	99						1	9	16	15		
	549	424	415	373	2,191	1,868	30	6	1,724	1,701	778	883	147	160	16		556	1,217	7,887	4,910	57	1,752	
3		3		1	50	40			12	34	40	20							2	2			
5	14	5	15	15	12	8			10	15	20	8		2				10	20	8	8	8	
7		1	2		47	50	15	25	121	447	80	30							1	3	2		
2	39	130	3	297	164	259			13	135	81	66					1	4	6	46	8	57	7
					14				10		25		10		2								
10	7	10	42	10	150	26			568	520	85	16	21	9						10	10	7	
20	10	13	43	62	527	318			311	816	200	86				1	3	5	11	27	50	12	
16	4	10	2	11	226	100			45	20	249	410	4	5				1 1/2	1 1/2	14	13	13	
	38	49	39	31	1,016	187	30		1,657	181	670	183	5				251	230	5,286 1/2	126	2	1,467	
75	56	37	64	355	1,951	1,670	10	8	127	102	499	570	211	165			5	53	220	26	43	7	
				3							18		4										
37	38	96	87	90	1,970	900			680	408	1,942	650	650	37		3	8	125	70	126	132	26	
12	28	9	21	17	124	83			427	275	104	58	9	7		1		1	2	56	20	35	
	102	260	127	185	1,948	142			351	1,112	845	57					436	567	28,585	9,652	57	131	
6	154	137	735	828	608	185	11		596	140	537	54	201	13	6		3,509	1,266	626	404	28	389	
65	42	113	1	83	324	506			366	145	124	256					1	1	37	97	755	27	
21	24	10	84	44	306	203			828	816	141	214					104	36	15	5	23	16	245
	1		28		12		1		16	82	26										5		
92	450	300	565	806	549	112	11	21	659	168	200	108			20		476	800	224	116	240	1,117	
00	12	8	90	45	3,458	2,112			5,000	3,000	600	300	575	325	40		3	2	25	15	130	70	10
81			4	120	351	421			917	1,085	194	139										3	
14	8		20	17	528	300	7	3	280	400	73	10						6	20		31	50	
					5						4		2							1		2	
10					43	70	6	2	12	18	13		2							2		1	
16	76	175	50	54	3,395	1,520	108	57	1,200	1,670	2,050	1,000					8				3	1	
87	30	21	156	451	1,707	800			1,018	1,581	984	423					1	1	15	55	990	540	13
14	57	86	22		180	160			5	43	94	84								37	33	38	
4	14	70	18	4	597	384			143	79	170	222					1	4	15	97	11	25	
34	53	92	10	97	2,102	1,080			600	728	221	286						1	3	24	159	145	13
					25	10					20	30	3					2	2	13	55	311	4
5	50	132	30	290	2,160	1,640	56	72	1,971	3,150	350	292					12	51	50	54	3	4	20
8	12	6		2	90	7			8	1	58	10	37	52				2	2	4	3	5	7
17	35	27	47	568	113	105	5	11	379	464	58	159								328	25	125	997
7	58	10	12	11	620	420			790	792	410	211	5	10						5	160	339	
25	37	5	13	120	84	267			127	180	122	207	20	8				9	2	31	180	10	5
65 1/2	2,558	2,678	2,888	5,114	33,791 1/2	21,085 1/2	551	529	25,328 1/2	24,298	14,968	9,374 1/2	3,745	1,269	150	42	5,612 1/2	4,450	41,248 1/2	18,758 1/2	4,386	4,842	6,520

Prices received in Yuba last season and this ranged as follows:

	1891.	1892.
Apples.....	3/4 to 2c.	1 to 2 1/4c.
Apricots.....	1 1/4 to 1 1/2c.	1 1/2 to 2 1/2c.
Cherries.....	4 1/4 to 10c.	4 to 10c.
Figs.....	3 to 4c.	3 to 4c.
Peaches.....	1 1/2 to 2 1/2c.	2 1/2c.
Prunes.....	1 1/2c.	2 1/2 to 2 3/4c.
Nuts—Almonds.....	10c.	12c.
Walnuts.....	8c.	8 to 9c.
Raisin grapes.....	1 1/4c.	1 1/4c.
Table grapes.....	2 to 3c.	2 to 3 1/4c.

ACREAGE AND VARIETY OF FRUITS IN YUBA COUNTY.

Variety.	Acres in Trees.			
	Bearing.	Non-Bearing.	Total.	Plant of 1892.
Apple.....	97	6	103	2
Apricot.....	109	53	161	20
Cherry.....	14	25	39	10
Fig.....	37	5	42	3
Olive.....	13	120	133	35
Peach.....	84	267	351	58
Prune.....	127	130	257	33
Pear.....	122	207	329	80
Plum.....	20	8	28	2
Lemon.....	9	2	11	1
Orange.....	31	180	211	35
Nuts—Almond.....	10	12	22	4
Walnut.....	5	3	8	1
Raisins.....	262		262	
Table grapes.....	33		33	
Small fruits.....	10		10	
Totals.....	987	1,018	2,005	284

CHAPTER IX.

REVIEW OF THE FRUIT SEASON.

The fruit season now drawing to a close has been an especially good one for the growers of California. While there has been a shortage in many varieties, especially in prunes and peaches, in many parts of the State, the largely increased demand over last season, with its necessary increase in price, has very much more than compensated our fruit growers for their shortage, and the amount of money brought into our State by this industry will largely exceed that of any preceding year. Reports reached us early in the season to the effect that over a large part of the Eastern States a heavy shortage was probable in all lines of fruit, amounting in some parts to a total failure. This would necessarily cause an increased demand for the California article. The result was that prices which started low early in the season steadily advanced until very high figures were reached.

The disordered condition of the market in 1891 led to the very cau-

tious purchase of dried fruit by the jobbers, and a large surplus was supposed to be on hand. This, however, had been exhausted before any returns from the present season were made.

The State Board of Trade made an effort to open a market for the supposed surplus, and made a shipment of dried fruit to England. The shipment was made simply as an experiment, and went forward in the usual manner, and was sold through the ordinary channels of trade. After paying freights, duties, storage, drayage, and other incidental charges, it was found that the peaches and nectarines netted 9 cents a pound, and the apricots 7½ cents.

"We then concluded," said Mr. Gregory, "to make up a full car, but to our astonishment, after canvassing the State, we found that we could not get enough dried fruit together to make up the shipment. I consider this a most favorable condition of the fruit business. Early in the season it was generally believed that our market was glutted with dried fruit, and that we had overproduced ourselves in this regard. Now this supposed surplus was all sold, and a couple of months left between us and the season's pack.

"These facts show that the market is constantly opening into districts throughout the United States hitherto closed to us. We have also demonstrated that England, with her millions of consumers, is ready to take our fruit, even at advanced prices.

"The prospect for the fruit grower never looked better than at the present, and there is no danger of those who invested in the enterprise failing to realize handsomely if they attend to business and produce a marketable article."

Fruit crops in the Eastern States, which gave good promise early in the season, were greatly damaged by cold, wet weather, and the season was unusually late. In Illinois, Indiana, and Ohio the crop was very poor. In Michigan less than one third of a crop was reported. In Kentucky the report was fair to poor. In Missouri, Kansas, and Nebraska the yield was very light and the fruit very poor. In portions of Iowa the crop was fair, but in the greater part of the State it is reported as very poor. In Wisconsin and the Dakotas the yield was average, and in Minnesota fair. In some of the Southern States there was a fair peach crop, but in the large peach districts of Delaware and Maryland the crop was very short. This is caused, largely, by the yellows and rosette, with which this district, in common with many other peach sections of the East, is afflicted. In relation to these diseases, and their effects, J. J. Pratt, of Yuba City, who visited the peach districts of the East during the fruiting season, said: "In a year or two longer the fruit growing of the East will be a dead letter. The disease known as the yellows is something terrible; it is far worse than the combined enemies of the California orchardist. Where the yellows is prevalent the fruit tree is doomed. Trees in those districts will not live over two years, and the disease cannot be eradicated from the soil."

The cautious purchase of last season's crop, the exhaustion of the stock of dried fruit in the market, the shortage of the Eastern crop, caused by an inclement and unfavorable season, and the spread of orchard diseases, all combined to make a demand for California fruit, and to advance its price early in the season.

The probable advance in the value of fruit was early appreciated by the canners and packers, who endeavored to make season contracts at

low rates, and were in some cases successful, but in a majority of cases the grower got the full market value of his crop.

The season of 1892 opened with great promise to the orchardist, and the prospects were good for an extraordinary yield. A change, however, came, and in the place of a warm, early season, April came with bright, cool days and frosty nights. Late rains, coming when the trees were in bloom, had washed away the pollen and prevented the setting of a large part of the crop, and this, followed by the cold weather, seemed for a short time to threaten the entire crop; but the result proved that while the crop was much below the average in most lines, the fruit as a whole was better, and the increase of prices raised our orchardists from the prospects of a total loss to an assured season of great prosperity. Apricots on the trees started at \$15 per ton, and soon advanced to \$20, then to \$30, and for a short time were held as high as \$40. Peaches took a like advance, and in a few days went from \$20 to \$38, while prunes sold at \$35 to \$45. Other varieties kept pace with the demand, and for all very good prices were received by the grower.

The result of the low prices of 1891 was to largely reduce the acreage of new land set to fruit in the season of 1891-92, and a much smaller area was set out this season than otherwise would have been. The present high prices will give a great impetus to the new planting, and the outlook at present is that a larger area will be set to new fruit during the coming season than during any one season in the past. Carefully compiled statistics by this department show 274,377 acres in bearing, and 131,617 acres not yet in bearing. Of this amount 95,635 acres are in raisins and table grapes, leaving a total in fruit trees of 310,359 acres. Of this 49,055 acres have been planted during the past season. It is probable that the plant of the coming season will exceed this by 25 per cent.

In view of the enormous area in fruit in our State, which is being increased by large annual additions, there are many conservative people who view the future industry with dread. These forget that the history of the past shows that markets always open to us as fast as we can produce enough to command them. In the earliest period of fruit growing in our State, when we had but the local market, the man who had the temerity to plant a whole 5 acres to fruit was considered as rashly preparing to overstock the market; and when less than twenty years since we made our first shipments East it was predicted that the supply of the next few years would certainly greatly exceed the demand. But California fruit gradually became known in the East, and from an occasional carload the export grew to train loads, and still there are but a very small proportion of the people of the United States who ever taste, or even see California fruit. As our new orchards come into bearing we will naturally reach out for new markets. The increase for the decade ending with 1890 was: of dried fruit in 1880, 590,980 pounds to 64,595,181 pounds in 1890; and of green deciduous fruit, 5,185,650 pounds in 1880 to 68,084,124 pounds in 1890. The shipment of citrus fruits was not worth recording in 1880, but from 1882 to 1890 it has sprung from 917,000 pounds to 20,811,560. Raisins have increased in the same time from 790,630 in 1880 to 41,120,330 in 1890. These are shipments over the Southern Pacific system alone. In addition to these there were shipped by the Santa Fe system in 1890, 49,975,000 pounds of citrus fruits, 21,217,271 pounds of dried fruit, and 13,750,000 pounds of raisins.

These figures are given here to show the enormous and rapid increase in our fruit output, and despite it all, and despite the fears of the conservative minded, we have found an increased market for our entire product as rapidly as the supply has increased, until fruit growing is in a better condition to-day, with the vast area we now possess, than it was twenty years ago with the then limited area.

Touching upon the question of future markets for our fruit products, W. H. Mills, in an address before the State Board of Trade, outlines the following plan, which is produced here, as it gives some valuable facts and excellent advice:

"I find a prevalent opinion to exist, which is a matter of surprise, to the effect that California sells fruit to the East because of earlier conditions. It is the commonly received opinion that our fruits ripen at a different time, and that our sales in the East are made when the home product is unavailable. This is not true. The fruits of the East, when taken in their entire variety, ripen in the months of July, August, September, and October. Take the green fruit shipments of 1891. We shipped from California, in the green form, 3,420 carloads to the Atlantic States, Middle States, Western States, and the State of Colorado. Of this total shipment, 2,893 cars were sent forward in July, August, September, and October, the four months covering the fruit harvest period of the East, leaving but 527 cars for the months of May, June, November, and December. It is significant that we shipped no fruit in the months of January, February, March, and April, and but 22 cars in May; the first five months of the year, therefore, practically show no shipment. Our shipment begins in June, and more than 80 per cent of the entire shipment finds a market at the East, in the face of the domestic fruit markets of those States.

"In the brief address of a month ago, the opinion was vouchsafed that we had not placed our fruit within the reach of five millions of people. If this statement needs modification, it is in the direction of a reduction of the number. The early fruits reach the Eastern market at such rates as to make them luxuries. I have personally examined the market in the month of June, and found cherries selling at \$2 50 per box, when they were being marketed in San Francisco at 35 cents per box. I have information to-day that California peaches are selling at 7 cents a peach in New York at the retail stands. It is not enough that our fruits are placed in the markets of the East; they must be placed there at such rates as will enable the masses of people to consume them. Considered in this light we have not placed our fruit, on an average, within the reach of one million of consumers.

"It was also stated, and from data which may not be disputed, that the orchards of California last year produced 300,000 tons of green fruit, which was shipped in the various forms of dried, canned, and green fruit, and found a market in the world. This statement will not be controverted, since it cannot be successfully. Within twenty years fruit shipment has grown to the enormous proportions herein indicated. The question we are considering is: How shall we so distribute the fruit as to bring it within the reach, physically and financially, of a large number of consumers? and the question is one of a simple proportion. If, at the present prices, and with the present facilities for distribution, we have found a market for 300,000 tons, and yet have placed the fruit, when the price is considered, within the reach of 5,000,000

people, may we not hope to double the market when we bring that product within the reach of twice that number, or treble it when we have reached three times that number?

"The whole subject opens a wide field for contemplation, when we consider the leading factors of the problem. First, we have an unlimited capacity for the production of fruit; second, we have economic advantages in its production which will enable us to offer it to 65,000,000 Eastern consumers at a price which will justify them in purchasing. Between the price paid to the grower and the price paid by the consumer there is a vast margin. The commission alone on the sale of our fruit is 7 per cent, and that of itself constitutes a market-seeking fund which should incite distributors to the highest activity. The present method of distribution is costly to the consumer, and all high cost to the consumer means a small reward to the producer. The higher the price paid by the consumer, the less the producer will get. High prices discourage consumption and enforce the condition of overproduction. So far as relates to green fruit, the commodity is exceedingly perishable. Commercially considered, every cargo lost is charged to the successful venture. Further examination into the subject convinces me that much improvement has been made over former years in the way of distribution. The more important intermediate stations are supplied with carload lots; but the general statement that the fruits are shipped in carload lots to the large commercial centers for distribution remains true. In the year 1891 we shipped to the Atlantic States 909 carloads of fruit. There are but five places mentioned, as follows: New York, 530 cars; Boston, 121 cars; Philadelphia, 11 cars; Baltimore, 1 car, and Buffalo, 1 car. Of these five cities, two receive 1 car each and one, a city of a million of inhabitants, receives 11 cars. There is a growing market for fruit west of the Missouri River. For illustration—of the shipments of 1891, Butte, Mont., received 48 cars, and Denver, Col., 150 cars. Can it be said of an enterprise that it has reached its full development when a market is found in New York City for 530 carloads of green fruit in the year, while in Philadelphia but 11 cars are used? Philadelphia has at least one half the population of the city of New York, while the climate and commercial conditions are completely analogous. But these 909 carloads, shipped to these Eastern centers, pass through towns, villages, and cities whose population in the aggregate is equal to the population of the cities to which the fruit was consigned.

"Briefly, then, what is proposed is a system of direct distribution. It is evident that the 1,142 carloads of green fruit shipped to Chicago were reshipped, and this is the feature to which objection is raised. If a carload of fruit was shipped to Chicago, and was subsequently reshipped to Milwaukee or Minneapolis, an additional profit to the middleman ensued. Thus the fruit was burdened with a price that placed a limit upon its consumption. It will be gratifying to the members of this Board to know that the proposition of direct shipment to all the centers of the East, great and small, instead of shipment to commercial centers for secondary shipment or redistribution, has met with concurrent favor at the hands of the press and the people of California. The transportation companies of the country stand ready to second any improvement which may be devised, or be sought to be applied, by the consignors of the freight. The present facilities for freight shipments from the Pacific Coast to the Eastern States constitute the cheapest

service, when rate and speed are considered, that is performed by the railroads of the United States.

"This great concession to this industry by the railroads of the country stands fully acknowledged by shippers engaged in this species of merchandise. The determination of methods of distribution of any species of merchandise does not lie with the carrier; it belongs to the shipper only. Fruits are shipped by order of the consignor, and are secured to the consignee. The vast system of network of railroads, connected by the long-distended lines which reach the Pacific Coast, stands ready to perform the carrying service, and has actually performed this service at the minimum cost of movement alone. A better system of distribution is therefore not obstructed, either by the rate at which the fruits are carried, or by want of liberal facilities for the carriage. Distribution is the office of merchandise. The problem to be solved is therefore a mercantile problem, to be solved by the merchants engaged in this great enterprise, and not by the carrier who carries the fruit to its proper consignment according to order.

"What is sought is a market commensurate with the possibilities of production in this State. The magnitude of the opportunity is appreciated only by those who have given the subject thoughtful attention. A single purchaser of dried fruit in the city of San Francisco purchased in the space of one month \$1,600,000 worth of fruit, and even the recitation of this fact does not disclose fully the vast volume of business possible to that industry.

"The next consideration relates to the profit of fruit growing. A profit equal to \$1 a tree, or half that sum, or a quarter that sum, will confer upon our commonwealth a profit far in excess of that attending any other cultivation of the soil. We are enjoying in the current year the highest prosperity the fruit growers have known, and yet the whole enterprise has made its way against continued predictions of overproduction and ultimate failure.

"The magnitude of the opportunity also suggests at once the possibility of a special equipment and special treatment of the whole subject. We are in plain view of the ultimate possibilities of this industry, and the time has arrived when we may safely prepare to adopt such methods as to its commercial features as will take it out of the list of ordinary commercial transactions, and justify the inauguration of separate and special instrumentalities of distribution. In its practical aspect the proposition demands the formation of a commercial company for the sale and distribution of the fruit. The auction method having proved successful, it is practicable to send to every town or city in the United States, where a market for a single car might be found, a carload of fruit to be sold at auction; and this fruit should be sent directly from the centers of distribution in California, and regardless of centers of distribution at the East. As supplemental to this, it is competent over Eastern lines to distribute fruit in less than carload lots, over short distances of distribution. Thus continuing the present method of sending all fruit to the great commercial centers of the country for which a market might be found, let it be supplemented by a distribution in less than carload lots through the instrumentalities of local railroads everywhere. When that is accomplished, a process of the steady growth and expansion of the industry will have set up. It will have become organic, and, obeying the law of all organism, will continually grow. It will

offer a competition to the growth of fruits in climates not favorable to their production, which will eventually give us absolute control of the markets now being supplied by Eastern producers. This is true, because it is true in modern economic methods that, notwithstanding the distance intervening between points of production and consumption, every article is being produced in the soil and climate and under the conditions most favorable to its production. It is absurd to suppose that this law of modern economics is not equally applicable to the production of fruit in California, when the favoring conditions in this State are understood, or when they are contrasted with the unfavorable conditions of other portions of this country. The very contrast closes the argument.

"General farming, however profitable, can never confer population. Whether true or false, it is a leading tradition of general farming in this State, that its highest profit is derived from large aggregations of ownership. These large aggregations have taken place, and the tendency is constantly in the direction of still greater consolidation of ownership, and constant depopulation of the country. On the contrary, the industries connected with the orchards, vineyards, and gardens of California have an inherent tendency of segregation. Ten acres of orchard, vineyard, or garden will afford profitable employment to fifty times the labor which is expended upon 1,000 acres of ordinary wheat land in this State. The acquirement, then, by this commonwealth of a great substantial industrial foundation, lies plainly in the direction of availing ourselves of the peculiar advantages of our climate. The absence of cheap coal, that reservoir of mechanical power, forbids the hope of the establishment here of great manufacturing enterprises, with their density of population. In fact, as already shown, the successful establishment of a basis industry will eventually confer upon us manufacturing facilities and incidental enterprises in every direction; for wherever a substantial industrial basis is established, diversity of profitable occupation arises as an inseparable incident of prosperity.

"Commerce is but an incident of industrial activity. The volume of commercial transactions, as relates to any people, is measured by their purchasing power, and the supreme source of wealth in any community is the productive capacity of its people. Horticulture, prosecuted under the unrivaled advantages which attend it here, leaves us without a competitor. Upon this substantial and enduring basis the entire industrial structure will eventually rise.

"The suggestion of a more distributive market for our fruit has elicited the widest discussion. It should not constitute a discouragement, that some conservatism of the old methods has developed. The California Fruit Union, now in successful operation, developed like discouragements. The auction plan, that has proved so valuable an adjunct as a market method, was established against the strong skepticism of those who had no experience of the method. Inquiry among experienced shippers of fruit, and those who have had observation of the present methods of distribution, has developed a great diversity of opinion. I content myself here with the introduction of a highly intelligent Eastern opinion on the subject. Prof. W. A. Henry, the Dean of the Agricultural College, University of Wisconsin, visited this State in 1886. He made a critical examination of our orchards and vineyards, and at that time expressed the opinion that when our orchards came into bearing we would reach a condition of overproduction. Since the last meeting

of this Board I have had the pleasure of an extended interview with this gentleman. His views afford an opportunity to judge of this whole question from a highly intelligent Eastern standpoint. He says the State of Wisconsin has 1,600,000 inhabitants; that, except an occasional carload of fruit sent to Milwaukee, no California fruit has ever been made accessible to its inhabitants. Residing in the town of Madison, Wisconsin, a city of 15,000 inhabitants, he states that no carload, nor part of a carload, of California fruit has ever reached that city; and yet he declares that there is a market for fruit at that place in carload lots. The city of La Crosse, having 30,000 inhabitants, is cited as an example where no carload of fruit has ever been shipped. Discussing the general features of the suggestion, he declares that there is a market in Wisconsin for California fruit equal to the entire market found at Chicago in our former experience. By this same authority we are informed that for special occasions people throughout the State receive small lots of fruit by express, for which they pay enormous prices. They purchase California grapes at the rate of \$200 per ton, and other fruit in like proportion.

"I close by quoting a very significant sentence from the interview with Professor Henry: 'The products of Wisconsin, Minnesota, the Dakotas, and the whole Northwest are naturally supplemental with those of California. We need your fruits. We cannot raise them at home. The attempts to plant orchards have proved failures. The orchards that have been planted are no longer tended, and are falling into disuse. I never saw but a single peach blossom in the State of Wisconsin. The peach tree that came under my observation reached the height of 3 feet and bore a few blossoms. That bloom was the only bloom I ever saw in the State of Wisconsin. I am not saying that Wisconsin is not a good State. We have a State rich in varied resources, but fruit is not one of them. Our present population of 1,600,000 can be converted into consumers of California fruit by placing it within their reach.'"

An effort was made during the summer to open out to our fruit growers a market in London, and to this end several shipments were made by the California Fruit Transportation Company. Arrangements were perfected whereby the steamers "Majestic," "Teutonic," "Britannic," and "Germanic," of the White Star line, extended the refrigerator service of the California Fruit Transportation Company to Liverpool and London. Each of the vessels above named was prepared to carry 5 carloads of fruit, and arrangements were made to ship this amount every week. Arrangements were also made with the Southern Pacific to send forward a special fruit train each week, to go through to New York in six days and connect with the steamers. The fruit all arrived in good condition and sold at fair prices. Out of the first shipment some samples were sent to Queen Victoria, who sent her acknowledgments of the same, stating that she had found it very palatable. Owing to the heavy storms prevailing on the British coast, the "Teutonic" was somewhat late in arriving, but the fruit, nevertheless, was in excellent condition.

Great crowds attended the sale, and the prejudice against "cold fruits" (fruits shipped in refrigerators), formerly entertained, is rapidly disappearing.

The prices obtained for the third shipment were as follows: Pears,

\$3 to \$3 75 a box; peaches, \$1 75 to \$2 25 a box; plums, \$1 75 to \$2 50 a box.

The fourth shipment left New York on the "Majestic" on August 16th, and the fifth shipment left Sacramento on the same date.

In speaking of his experiment at the time, A. T. Hatch, the originator of the scheme, said of it: "I believe it will be a success. Of course, I cannot now tell to a certainty, but I believe it will. I am advised that the fruit sent hitherto has arrived in good condition, and that is a great point. As for the statement cabled from London that the English merchants think the fruit sent in refrigerators will not keep long enough for them to get rid of it, that should not trouble California shippers.

"I had the same thing stated to me five years ago when I began shipping fruit in refrigerators to New York. Then they said it would not keep, that the fruit would all fall to pieces and decay as soon as it was taken from the refrigerators, but it did not do so. They found it would keep days and days in good condition, while the New Jersey fruit, run over in an hour or two, would go to pieces the next day.

"This train consists entirely of peaches and pears. I am sending no plums or prunes. On being delivered in New York the cars are put on lighters and conveyed at once alongside of the trans-Atlantic steamer on which the fruit is to be sent. Thirty minutes only are required to transfer it from the refrigerators of the cars to the refrigerators of the steamer. This does not give it much chance for the temperature to be changed.

"The first shipment of California fruit arrived in London a few hours less than fourteen days from the time it left Sacramento, and on the sixteenth day, and the seventeenth from the time it was picked, it was sold. Yet it was then in excellent condition. This shows to me that it will stand the shipment. The only thing is, can we get prices that will warrant the shipment? I believe that when the English people get to see fully what this fruit is they will want it. Anyway, it shall be tested fully.

"I will have about \$30,000 in with this fourth train, including what I have sent before. It is a good deal to put in before results are fully known, but having begun, I am not willing to quit till the full facts are known."

Prices did not rule so high for our fruit in London as had been hoped, and the high prices in the Eastern States, combined with the comparative shortness of our own crop, gave to the experiment an unsatisfactory outcome. It has been demonstrated, however, that we can ship fruit to London, and that it will arrive there in good condition; and we have here an assurance of a market for our surplus, when from any cause, such as large crops in the East, or very large yields in our own State, our home markets shall become glutted. In view of the vast area of non-bearing orchards in our State, with the large plantings that will unquestionably be made in the near future, even the partial success of this experiment gives us the assurance of a fair foreign market for our fruits when our home market shall be supplied, and the assurance of an outlet for our overflow sets at rest the question of overproduction.

In commenting upon this matter of exporting fruits to England, W. R. Carson, of Santa Monica, who is well informed in regard to the English market, says:

"It would be a great boon to England, as well as advantageous to

California, if some of the fruits of this country could be put on the market there in good condition, and at prices that would command a market, but it is very desirable, to prevent mistakes, that the conditions of success should be well understood. Some of Col. Creed Haymond's statements, although to a certain extent correct, are yet very misleading; on some points he has got hold in some way of erroneous ideas that are equally misleading. Such as this: 'In London, fruit is practically beyond the reach of the masses, the prices are so enormous.' On the contrary, in London and other cities fruit is hawked about the streets in wheelbarrows at prices that artisans can afford. It is many years since pineapples from the West Indies began to be sold by these men at 2 cents a slice. In 1858 I sold from my orchard in a suburb of Manchester, Damson plums at about a cent a pound, selling to a dealer by the peck, on the tree. In 1875, in Chestershire, not 20 miles from Manchester, I was told on the spot that plums were so plentiful that they could not be given away. These were exceptional years, of course, but they show the necessity of care and caution. Canadian and United States apples are sold on the quays at Liverpool at \$3 to \$5 50 per barrel. Newtown Pippins are sold in first-class shops in Manchester at 8 cents a pound.

"With regard to peaches, very few are grown. Trained on a south wall, in a favorable locality, and well managed, the trees ripen their fruit, but the supply is very limited. They are also grown by gentlemen, under glass, for their home supply. There are quite as fine peaches there as here, but there is a market for quantity, if they can reach the market in good condition, at say 12 cents a pound up to 18 cents. The same may be said of apricots.

"Tomatoes are imported from Canada, as well as home grown, but possibly in the first three months of the year they would find a good market.

"Grapes do bring \$1 to \$1 50 a pound, but unfortunately the latter price is at the time when there is not a grape in California. Usually the lowest price for hothouse grapes is 60 cents per pound, when they are most plentiful, the finer qualities bringing higher prices of course. If the Muscat grape can be put on the market in Great Britain in good condition it will sell, but not in quantity, unless at low prices. From Spain are imported great quantities of a white grape called Almeria—probably from the name of the port of shipment—and the usual retail price of this grape, in Manchester, is 12 cents, rising to 16 as it becomes scarcer. It is so much inferior to the Muscat that the latter would bring 24 cents, and at that price would be in great demand, because it would reach a great body of people who could afford that price for family use—people who never buy hothouse grapes except for a party or an invalid. The growers here cannot get above 1 cent a pound, and between that and 24 cents there is a wide margin for expenses and middlemen's profits. There are no customs dues on green fruit. (On currants the duty is about two fifths of a cent per pound; on prunes and raisins it is not quite 1½ cents.) My object in writing is to promote a trade beneficial to both countries, and in connection with that it is worth while to draw attention to the fact that in 1893 the ship canal will be opened to Manchester; that Manchester is a great fruit and vegetable market—the central market for a great extent of country, thickly populated, dotted with towns—and that ships of any size from an Atlantic

port need not break bulk until they reach the quays at Manchester, where they will find a market equal to that of London."

Another experiment in marketing was made the past season in selling the fruit at auction. There have been complaints loud, deep, and bitter on the part of the growers against the middlemen, who have been charged with all sorts of unfair treatment. A way out of their power was sought for, and when the auction system was proposed it was generally indorsed by the growers as offering a means to escape from the exactions of the commission merchants, and a way of reaching the consumers without their intervention. Resolutions were passed by many fruit growers' associations, of which the following are a copy:

Resolved, That all present hereby agree that all fruit and vegetables sent to San Francisco for the open market shall be sold at public auction.

Resolved, That all fruit growers here present indorse the auction system of selling our fruit and agree to give it our hearty support.

Resolved, That we, as fruit growers, give the auctioneers our continued and hearty support.

In commenting upon this movement, the "Examiner" said editorially:

"The fruit growers will watch with lively interest the experiment of auction sales of fruit in this city. The condition of affairs in the San Francisco market has been unsatisfactory for several years to consumers as well as to producers, and both sides will welcome anything that will remove the causes of trouble. The San Francisco consumers have complained each season that it was difficult to get good fruit—that the orchardists unloaded culls and third-grade fruit on the city and charged first-class prices, while all the good fruit went East. Instances in which good California fruit could be bought in Chicago for less than was charged for an inferior article in San Francisco have been cited by the San Francisco consumer, to show that he was not being fairly dealt with, and he has clamored that as he was willing to pay a good price for the first-class article he ought to get it. The fruit grower has retorted that the San Francisco market got better treatment than it deserved; that he could not get more in it for good fruit than he got for third-grade; and that when he sent anything here he was just as likely to get a return from the commission merchant that the fruit had been dumped in the bay as to see any cash.

"The high prices to consumers and low returns to producers have brought out many suggestions for a remedy. Coöperation, by which most of the middlemen might be dropped out and the greatest expense saved, has been the most popular in theory, but nobody seems to have found any way by which the suggestion might be put into practice. The plan of forming a company to buy fruit in the orchard and sell direct to the consumer or the retailer, offered a good chance of profit to good business men, but no capitalists have been attracted to the enterprise.

"The auction plan of disposing of fruit has had many advocates, and the success met with in its operations in the East gives ground for their confidence in it. It is to be hoped that it will work as well here as in Chicago. If it can be fairly carried out it will remove the standing complaints of false returns. Prices at a public sale cannot well be manipulated or concealed. The publicity may do something, too, to keep the prices to the consumer and the returns to the grower from

getting so far apart as in the past. At all events the experiment is worth trying. It is to be hoped that it may result in bringing to San Francisco good fruits at prices fair to both buyer and seller."

This method of disposing of fresh fruit was given a short trial and abandoned for the season, the reason alleged being that it was started too late in the season, after the canneries had been pretty well stocked, and as a result they were buying little fruit at the time, and the bidding was almost entirely by the commission merchants. Enough was done, however, to prove that there is a way to escape injustice, when such exists, on the part of the dealers, and to insure fairer treatment of the producer in the future. One of the heaviest fruit producers who favored the auction system, in speaking of the experiment, said in regard to it, upon its suspension:

"I know that the commission merchants of San Francisco have been sneering at the auctions from the day that they were introduced, and although they will deny that there was any concerted movement among them to render the scheme inoperative, I am fully convinced that there was such an organized movement.

"Of course the commission men have cried down the auction sales. It was striking right at the very root of their business. It was a fight to determine whether the consignments should be sold in a public place, where the terms were known to all, or whether the practice of private sales and private prices should prevail.

"Let the dealers say what they will, the auction system, had it been successful, would have been one of the greatest blessings to the producers that could be devised for their welfare and prosperity. I do not think that there is a single fruit raiser in the State who is at heart opposed to the auction plan, although there are a number of them who are not free to express their opinion in the matter, on account of their financial entanglements with commission houses.

"Let me tell you of some of the disadvantages under which the average grower is placed. I am speaking now of the poorer and middle classes, who, as a rule, are so situated that they wish to realize upon their crop the moment it is in a condition for marketing. There are but two avenues open to the producer—the cannery or the commission house. I will take up the cannery first. The grower, when his fruit is nearly ripe, takes a sample to the canner and submits it for inspection. A price of say \$20 per ton is agreed upon, and the orchardist returns home satisfied that he is going to realize a fair profit on his crop. In a few days he picks his fruit and ships or hauls it to the cannery. Here his trouble begins. The Superintendent says that some very heavy shipments of the same kind of fruit came in the day before, and that the establishment is overstocked. He tells the seller to bring his goods next week. That, of course, is out of the question, as the fruit would spoil in the meantime. As a result, the unfortunate visitor is finally offered \$10 per ton for his crop, and he has no other course but to let it go at that price.

"Again, the canner finds fault with the quality of the fruit, or it is either overripe, or not ripe enough. The same result is reached in this case. The grower has his fruit picked, has paid for cartage, and if it is slightly underripe (a condition required by the canners), he cannot send it to market. He must take whatever price is offered to him.

"I know that there are tons of fruit rotting in the orchards this year. The owners would rather lose it all than submit to the grinding, crush-

ing tactics pursued by the canners. The men who can afford, however, to allow their crops to spoil, belong to the wealthier classes. Heaven help the man whose existence depends upon the product of his orchard.

"The commission house end is often just as bad as the canneries. The main trouble lies in the fact that the shipper is forced to depend upon the honesty of the merchant. So you see the shipper takes a risk in sending his goods to be sold on commission. I do not wish to be understood as making a sweeping charge of dishonesty against the commission men of San Francisco; there are many old established houses which have an honorable name in the community. What I wish to say is that the majority of the men in that business always get the largest and best end of their bargains.

"Another disadvantage to be encountered in sending goods to the commission men, is their proneness to neglect first consignments for the ones received subsequently. The later goods are sold off, and no effort is made to dispose of the earlier receipts. In this case the growers will probably receive a return something like this:

"We sold ten boxes at \$1 each, twenty boxes at 50 cents each, and the rest we were obliged to send to the dump."

"The shipper in all cases must take the merchant's word for the price received for consignments. If the dealer is honest, the fruit man is liable to be justly treated. If the merchant is unscrupulous, the grower has no redress if false returns are sent, as he has no means of verifying his suspicions. How does he know that half of his goods rotted in the stores and was sent to the dump?

"If the merchants would be satisfied with smaller profits, and set their first prices at lower figures, a beneficial change might result. Many of them, however, hold out so long for tip-top prices that the fruit spoils on their hands.

"There is bound to be some change in these methods," concluded the gentleman, "but it will not be until the fruit men of the interior combine, and establish an agency in this city. Such coöperative establishments are conducted elsewhere, and there is no good reason why one should not be in operation in San Francisco."

Another effort looking to the more advantageous distribution of fruit on the part of the grower was made in the attempt to organize a Dried Fruit Exchange. The plan of this was that there should be a central exchange in San Francisco, coöperating with which should be local organizations in each county. By the efforts of this association it was hoped that uniformity in grading our fruits, and uniformity in prices could be secured, while a wider and better market for our products could be created by unanimity of action on the part of our producers. Santa Clara County has already organized a Dried Fruit Exchange, and its working has so far proved satisfactory, and it is probable that a State Exchange will be organized and in operation in time to handle the crop of the season of 1893.

At the meeting of the State Horticultural Society, July 29th, E. W. Maslin submitted the report of a committee, previously appointed, to consider the feasibility of establishing a Dried Fruit Exchange in San Francisco, to the effect that a meeting had been held with fruit growers, and others interested, to discuss the question, on July 7th, and it was the sense of the meeting that the season had too far advanced to begin the enterprise this year, but the following resolutions had been passed:

Resolved, That the scheme of establishing a Dried Fruit Exchange is feasible and necessary for the interest of the fruit growers of the State.

Resolved, That we advise the State Horticultural Society to appoint in each county having a dried fruit interest, a number of persons whose duty it shall be to canvass the county for the purpose of inciting an interest among the fruit growers in the project of establishing the said Dried Fruit Exchange, to establish an association of fruit growers in each county, where there is no county fruit association, and to ask the cooperation of associations already formed, and to induce the sending of delegates to a convention to be held in San José on November 15th, then and there to organize a Dried Fruit Exchange.

The recommendations in the report were adopted by the society, and the same committee, with the addition of the Secretary, was authorized to select names in the different counties and submit them for adoption at the next meeting of the society. Further action upon this subject will be taken at the next Fruit Growers' Convention, which will be held on November 15th of the present year, at San José.

Local organizations for the purpose indicated are also in existence at Pomona, in Los Angeles County, and at El Cajon, in San Diego County; these, so far as reported, have been successful in their operation.

THE ORANGE.

The area of land in citrus fruits has been very largely increased during the planting season of 1892, less proportionally in the southern counties than in other sections of the State. In Tulare County very considerable areas have been set to orange and lemon trees, which thrive remarkably well in the foothill region of that county, as indeed they do in the foothill belt of the whole Sierra Nevada range. The citrus belt of California has been gradually widening, as experience has demonstrated that the fruits of this family would thrive over a much wider area than was originally believed. Very large plantings have been made in Butte County, and already some considerable returns are promised from there. In Placer County a number of orchards are already in bearing, and others are coming on. In fact, the orange and lemon will grow and flourish in sections in the greater part of the San Joaquin and Sacramento Valley counties as far north as Shasta. While this is true, the extreme southern counties produce so very large a proportion of the output of fruit as to be entitled to the designation of the citrus section of California.

The following able review of the orange season of 1891-92, from the pen of Harry E. Ellington Brooks, covers this subject thoroughly:

"The shipments of oranges and lemons from the six southern counties during the season of 1890-91, aggregated 4,593 carloads, or 1,312,099 boxes, divided as follows:

	Carloads.
Los Angeles.....	2,212
San Bernardino.....	1,708
Orange.....	516
Ventura.....	68
San Diego.....	66
Santa Barbara.....	23
Total.....	4,593

"Of these, about 4,000 cars were oranges, the balance lemons. The home consumption was probably 900 boxes, which brings the total to 5,500 carloads, or 1,650,000 boxes. At \$2 a box net to the grower, the

revenue from the Southern California citrus crop of 1890-91 was \$3,300,000.

"The season of 1891-92 opened auspiciously. There was every prospect of a good crop, considerably in excess of that of the previous year. The estimates ran from 5,000 to 6,000 carloads. Then came a disastrous wind storm about the middle of December, closely followed by heavy frosts during Christmas week, and all the calculations were rudely upset. The wind was particularly destructive in some of the choicest orange-growing sections of San Gabriel Valley, not only blowing off and bruising thousands of boxes of fruit, but in some cases even whipping the leaves from the trees. The frost, on the other hand, did its worst in some of the most highly regarded orange sections of San Bernardino County, which the wind had measurably spared, although the effects of the freeze were more or less visible throughout Southern California.

"It will be some months yet before the railroad companies make public the exact figures of the season's shipments. In a letter written on January 15th, after it was possible to estimate the damage by frost and wind, I ventured the assertion that the shipments for the season would not vary greatly above or below 3,000 carloads. A careful investigation, which I have recently made among shippers, now justifies me in stating that the aggregate shipments will be within a few carloads of 2,800, a falling off of 1,600 carloads, or about 35 per cent from the shipments of the previous season, instead of an increase of over 20 per cent, as was anticipated early in the season. Or, in other words, the crop was just half what it was expected to be at the beginning of December last.

"Of these 2,800 carloads it is safe to say that at least 800, probably many more, were more or less frosted or wind damaged, and ought never to have been shipped. Moved by a strong demand from the growers, who found themselves with damaged fruit on hand upon which they were anxious to realize something, a temporary reduction was granted in rates from California to Chicago of 35 cents per 100 pounds, making the rate 90 cents. The representatives of the Southern Pacific and Santa Fe companies at first wisely opposed the proposition, on the ground that the shipment of windfalls and frost-bitten fruit would spoil the reputation of California oranges in the East. Shortly afterward, however, at the end of January, the Santa Fe Company, seeing its way to capture some extra business, put the reduction into effect, and its rivals were forced to follow suit. The reduced rates lasted only about two weeks—seventeen days on the Santa Fe and fifteen days on the Southern Pacific.

"Seven hundred cars were shipped to Chicago under the 90-cent rate, all consisting of more or less damaged fruit. Some of the oranges were so badly frosted that they actually dried up and wouldn't even rot. These shipments proved a dear experience to the growers who made them. In a number of cases they were called upon by the consignees to pay the freight, and were thus worse off financially than if they had not made the shipments. The immediate loss is, however, trifling compared with that which must result from the bad impression made upon Eastern consumers. It will take years to convince many who tasted California oranges this year for the first time that we can grow oranges fit to eat. The shipment of this damaged fruit was a grave mistake.

"At the opening of the season local buyers held off, offering to ship on commission, but not to buy for cash. Later, when they began to buy, prices opened fair, ranging from \$1 a box for good Seedlings to \$2 50 for good Navels on the tree. A revulsion occurred after the shipment of so much damaged fruit to Chicago, and for a time it was almost impossible to sell at any price. The market was demoralized. During February, March, and the early part of April few shipments were made. Buyers then began to purchase, on the ground that the worst fruit had been disposed of, and prices advanced 25 per cent. Those who kept their fruit until the close of the season did fairly well, obtaining better prices, although for a much smaller crop. Navels are now worth about \$3, and Seedlings from \$1 25 to \$1 40. There are few in the market. The regular shipping season is supposed to close June 30th.

"From the above it will be seen that the past season has been a disastrous one to the orange growers of Southern California. It will, however, be a great mistake to suppose from this that the orange-growing industry in Southern California is not a desirable and profitable one, or that the orange growers are seriously discouraged. The chances are small of the early recurrence of such a combination of misfortunes. Moreover, those who are planting new orchards can, by studying the lessons of the past season, reduce the ill effects of such visitations, should they occur, to a minimum. The three most important of these lessons are the necessity of planting windbreaks, of selecting true citrus locations for orchards, and of shipping only first-class fruit in good condition.

"The necessity of windbreaks, which has been preached by many for years, is now generally admitted. This is anything but a windy region, but it is evident that we must expect a blow of more or less violence every few years. There was a similar visitation just three years previous to the one of last December. A triple row of eucalyptus trees, with a cypress hedge on the inside, will greatly modify, if it does not entirely avert, the disastrous effects of a heavy wind. Shortly after the December storm it was easy to note the difference in the appearance of trees thus sheltered, or sheltered by buildings, from those which stood exposed. Many orchardists say they cannot afford the space occupied by windbreaks. It is for them to decide whether it is more profitable to risk losing the bulk of their crop every few years than to sacrifice a row of trees. The drain on the soil near the gum trees can be met by a more liberal application of manure and water. Of course, in localities that are naturally sheltered, there is less need of such artificial aid.

"The selection of a suitable site for an orange orchard is the most important point of all. Many orange groves have been planted in sections where nature never intended an orange tree to grow. We are at the best on the northern edge of the true southern citrus belt, and extra care is therefore necessary in selecting a site. Unfortunately there has been and still is much misrepresentation on this point. When orange land with water is worth \$350 an acre, while adjoining land, also with water, but not suitable for oranges, is only worth \$150, the temptation is great for land owners to let the citrus belt out a hole or two. Buyers cannot exercise too much caution in this respect. Because an orange tree will grow and bear fruit in ordinary years, it does not by any means follow that the orange is a safe crop to grow in that locality, as many

have discovered to their cost this season. In some cases the distance of a few yards, with a corresponding difference in elevation, marked a plain dividing line between young orange trees wilted brown on the one hand and bright green on the other.

"As to the third point—the shipment of inferior or damaged fruit—shippers who burned their fingers last season are not likely to repeat the mistake. There is room for much improvement in the methods of marking boxes of oranges. Hitherto it has been the custom with some shipping houses to mark all the best fruit, wherever it was grown, 'Riverside,' a manifest injustice to other sections where just as good fruit is produced. A bill has been prepared and will be introduced at the next session of the Legislature, making it a felony, punishable by fine or imprisonment, to brand a box of oranges with the name of a different locality from that in which the fruit is picked and packed.

"The planting of orange trees in Southern California during the past season has been heavy, though not quite so heavy as in the previous year, which witnessed the most extensive planting ever known in this section. Had not some persons been temporarily discouraged by last winter's experience, the area set out would undoubtedly have been fully 25 per cent greater. To show how extensive the planting has been of late, it is only necessary to mention that the total acreage of orange orchards in San Bernardino County at the close of 1890 was 13,070 acres, while by the end of 1891 it had risen to 19,673 acres, an increase of 50 per cent. Previous to last season's planting there were, in the six southern counties, 3,800,000 orange trees, divided among the counties as follows:

	Bearing.	Non-bearing.
San Bernardino	400,000	2,000,000
Los Angeles	475,000	550,000
Orange	82,000	51,000
San Diego	27,000	177,000
Ventura	8,600	55,000
Santa Barbara	6,700	37,500
Totals	999,300	2,870,500

"Estimating the planting of the past season at 1,000,000 trees—a moderate figure—and transferring 1,000,000 from the non-bearing to the bearing column, this gives as the number of orange trees planted in Southern California, in round figures, 2,000,000 bearing and 2,870,500 non-bearing, a total of nearly 5,000,000, covering about 50,000 acres, or a little less than 80 square miles.

"There were about 500,000 lemon trees growing a year ago, which number has been at least doubled during the past year, there being quite a rage for lemon culture at present, owing to the introduction of a successful method of curing the fruit. When, in three or four years, all these trees shall be rated as bearing, and we add this aggregate to those now in bearing, we shall have a grand total of 6,000,000 orange and lemon trees, with as many more coming on, should planting keep up at the present rate. If the average production should still remain a box and a half to the tree, and the average price the same as now, we may look for a gross revenue of \$18,000,000.

"These figures appear large and naturally lead to the inquiry: Is there any immediate danger of overdoing the orange industry in Cali-

fornia? I think not. The product of these 5,000,000 orange trees in 1895 will give only two oranges a week, during the six months from December to May, to each family in the United States. During these months California has no serious competitor as an orange-growing section. The Florida crop comes in earlier than ours. Mexico raises some fine oranges, but they are in the market even earlier than those from Florida, and besides have to pay a duty. Sixty-one carloads were shipped from Sonora last season to the United States. Large California Navels sell for 25 cents apiece in the City of Mexico. A good many orange trees have been planted recently in the Salt River Valley, Arizona, and some oranges have been placed on the market, but with due respect to the manifold resources of that region, I think that it is too far from the ocean, and, consequently, too liable to winter frosts, ever to become an orange-growing country on a large scale. The Yuma section, lying nearer to the Gulf of California, is better adapted to the industry, but in any case Arizona oranges would be out of the market before the California crop is ripe. There remain the Pacific Islands, but as those oranges have to be picked green, it will be difficult for them to compete with ours.

"It will therefore be seen that from December to May, at a period when the market is comparatively bare of deciduous fruits, California orange growers have the markets of the North American continent to themselves. When it is further remembered that, as shown above, the area of first-class citrus land in California is quite limited, that much of this will be devoted to the culture of the lemon, and that new markets are constantly opened up, it becomes clear that there is little reason to anticipate overproduction. It must, however, be expected that prices will shade off a little after a few years. At half the present prices orange growing would still be a highly profitable industry. Decreased prices will, on the other hand, stimulate consumption. Unlike corn, beans, or other staples, the orange market is elastic, the consumption depending almost entirely on the price at which the fruit can be placed in the hands of the consumer.

"Freight rates play an important part in this question. The present rate to Chicago is \$1 25 per 100 pounds, about \$202 a car, or 87 cents a box, which is almost as much as the grower receives for ordinary Seedlings on the tree. The opening of the Nicaragua Canal would give a great stimulus to the export of our oranges to Atlantic points, and enable us to ship them to Europe at a profit.

"As to varieties, the Navel still holds its own as the king of oranges, and is the most extensively planted. A disadvantage is the large size of the fruit for the general trade. It is also considered less resistant to frost than the Seedling, and some have an idea that it becomes a rather shy bearer as it grows old. The Seedling sells at about half the price of the Navel, but yields nearly twice as heavily. However, one rarely hears of any Seedling trees being planted nowadays, with the intention of leaving them so. Next to the Navel in merit may be classed the paper-rind or thin-skinned St. Michael, a fine-flavored orange, with good keeping and shipping qualities, of uniform, small size, just right for the retail trade. The Ruby Blood, with flesh of even darker red than the Maltese Blood, commands a high price at present. The Mediterranean Sweet varies much in quality and has somewhat lost caste of late. Many growers are planting the Valencia, a very late orange, which

ripens in July and August. It is a fairly good orange, which keeps and ships well. A year ago a carload of this variety was sold in Chicago at \$7 a box, but when 10 carloads were shipped the market weakened. It is doubtful whether it would be safe to plant many of this variety, as there is little demand for oranges when the market is well supplied with deciduous fruits.

"From year to year growers are learning much as to the proper treatment of the orange tree. The industry is still quite a young one in the State, and we have yet much to learn. It has been found advantageous to trim the tree low, letting it assume more of the character of a great bush. In this manner it bears earlier and more heavily, and the ground around the trunk, as well as the trunk itself, is shaded. Another lesson that has been learned is that we have been budding too early at the expense of the vitality of the trunks. Some growers in the Redlands country will wait until their Seedlings are five years old before budding them. In this manner they will secure fine, vigorous trees that will withstand much hard treatment or adverse weather.

"There is quite a discussion at present as to whether it is best to use the sweet California or sour Florida stock. For the latter it is claimed that it is freer from root diseases, and does well in low, damp localities. On the other hand, it may be said that sensible men do not plant oranges in California in low, damp localities; besides which, it appears that the sweet stock in California makes larger and more vigorous trees than the sour. Dealers who import Florida stock are, of course, in favor of that variety, which is sold at lower rates than the home-grown Seedlings. Another lesson that most of our growers have at length learned, is the necessity of fertilizing orange orchards, especially after they begin to bear. A crop of oranges extracts an immense amount of nutriment from the land, and it must be replaced or the trees will inevitably suffer.

"Last year the Fruit Growers' Union of Southern California was inaugurated for the purpose of endeavoring to establish a home market by local auction sales; also, to systematize shipments to the East so that our own products might not be brought needlessly into competition with themselves, and to open up markets east of Chicago which have as yet scarcely been touched. The disasters of December put a temporary damper on the project and the operations of the organization during the past season have not been important or very profitable. There is need of some such organization to look after the interests of growers, but, as a rule, it is very difficult to get horticulturists to pull together.

"Orange growing in California is an attractive and profitable occupation, but it should not be forgotten that it is a business which demands a considerable amount of capital. First-class orange land, with a good water right, is worth from \$300 to \$400 an acre in Southern California, and two-year old budded trees, ready to plant, are worth \$100 an acre more. Adding the cost of planting, irrigating, and culture for three years, until the trees begin to bear, brings the lowest cost of a young bearing orchard close to \$500 an acre, without reckoning interest on the money invested. On the other hand, the profits, in an average year, if the orchard is well cared for, are large—perhaps not so large as some land owners and real estate agents would have us believe, but large enough for any reasonable investor. One hears of \$1,000 an acre. Such profits, and even more, have been made in rare instances from old

bearing orchards, but it is not safe to reckon on such figures. A conservative estimate is to calculate on making the expenses of care, cultivation, and irrigation the third year, \$100 an acre the fourth year, increasing gradually during the following ten years to \$500 an acre, or thereabouts. An orchard of good trees planted in a first-class citrus location, with plenty of water and good care, will often do much better than this, and should never do worse. After five years the owner of such a 10-acre orchard can take life easy. But he must have \$5,000 to start with unless he is a thoroughly practical man, who can do his own work and make a living from his land while the trees are maturing. In such case, by purchasing the land on easy terms of payment, he may get along with less money, but the work will be hard."

THE LEMON.

The lemon is rapidly growing in popularity as an orchard fruit, and during the past season very large plantings of lemon orchards have been made, especially in Tulare, San Diego, and San Bernardino Counties. This is justified by the large demand for this fruit and the prices paid for it. San Diego has given more attention to this branch of horticulture than any other one county. At Chula Vista, in the spring of 1892, over 500 acres of lemon and orange trees were set out, until now there is a total of 1,000 acres of growing citrus fruits. Last year a few older trees came into bearing, and the result was a total crop of about 300 boxes. This season all the four-year olds and the greater part of the trees planted three years are bearing well, and a careful estimate of this season's crop places it at about 1,200 boxes. Within the next six years there should be 1,000 acres of bearing citrus fruits, mostly lemons, in one solid tract, and less than one hour's drive from San Diego.

An acre of lemons is considered a very poor average if it does not yield at least a carload of fruit. This would be less than four boxes to the tree, and there are many three-year old trees there that will do as well this year, and even better. This fruit, when cured, is worth at least \$2 a box, or \$800 an acre. The 1,000 acres should then yield something like a gross annual income of \$800,000, to be divided among one hundred and fifty producers, or an average of \$5,333 each. These statistics are based upon the assumption that the planting of orchards has ended there, while in fact this is only a beginning of what may confidently be expected. Contracts have already been let for planting 400 acres the coming season.

The lemon is far less hardy than the orange, and the area suitable to its growth is therefore more restricted, and localities in which the orange would thrive are therefore frequently unsuited to the lemon. Mistakes have thus been made in planting the lemon in places too much exposed to frost or wind. But the causes which have led to the hitherto low estimate of the California lemon are twofold: First, the best varieties of the lemon were not originally planted in California. As a result of this a coarse, thick-skinned fruit was produced, having but little juice, a very bitter rind, and often bitter pulp also. Such a monstrosity was put upon the market after having been pulled ripe and yellow from the trees. Such fruit met only with derision when compared with the smooth, well-cured, thin-skinned, aromatic lemon of

Italy, and of course was a failure. Such was the earlier California lemon.

The grave error of planting the coarse seedling lemon was at length discovered, and such trees as had not been destroyed in disgust were largely budded to better varieties, as the Eureka, the Lisbon, and the Villa Franca. These trees produced a better fruit, and it was received far more kindly in the market; but yet it fell very far behind the best foreign fruit, and was unsatisfactory. As years passed, it was learned that the fault was mainly in the handling and curing. Nothing was really known of the best methods of curing and handling lemons until it was learned from hard experience by the foremost growers in the State, as G. W. Garcelon, of Riverside, and N. W. Blanchard, of Santa Paula. They and others found that success in lemon culture depended principally upon the manner in which the fruit was prepared for the market. It was easy to grow lemons, but to get them into the market in such condition as to make the business profitable was found to be quite another affair.

It was found that by cutting off the fruit when of a certain size, and before it had begun to turn yellow, putting it carefully away in a cool place until fully cured, it could be placed beside the foreign fruit without bringing a blush to the producer. The utmost care in handling is now known to be imperative. Treat lemons as eggs, and handle them accordingly. If one is dropped, even a few feet, upon the ground, reject it, for it will surely go to pieces before it can properly be sent to market. Approved systems are now widely known, and no fears need be felt on that score by those who would plant lemon trees.

The lemon crop of California is by no means large as yet, but is sure to increase rapidly from now forward. Too great care cannot be exercised in selecting a site for a lemon orchard. Except in a region practically exempt from damaging frost for the most part, and having a good soil and abundant water supply, avoid lemon planting. With all the favoring conditions, however, which may be found in several places in California, there is still ample room for a considerable additional area to be devoted to the production of this fruit, which is growing rapidly in public favor. The California crop has been estimated at a hundred thousand boxes for last year, but this is probably a very high figure. The difficulty of securing exact figures is found in the fact that the orange and lemon shipments are generally counted together.

The whole area planted to lemon trees in California is 10,056 acres.

Probably 95 per cent of all the lemons consumed in the United States come from foreign countries, chiefly from Italy. During the past eight years these importations have steadily increased, and have reached nearly 2,000,000 boxes, of say 300 lemons each, during each of the past two years. The total customs valuation of the lemon imports for the eight years ending with June 30th last, is \$27,814,174, or an annual average of \$3,476,772, but divided by years as follows: For the year ending June 30, 1885, \$2,510,426; 1886, \$2,608,810; 1887, \$3,835,147; 1888, \$3,395,983; 1889, \$3,189,534; 1890, \$3,374,032; 1891, \$4,351,970; 1892, \$4,548,263. From these figures it will be seen that the imports of foreign lemons have steadily increased during recent years, notwithstanding the increasing quantity of the home product. It will also be observed that the consumption of this fruit has apparently nearly doubled since 1885, and

should this ratio of increase continue, it would be many years before any possible California product could supply the entire consumptive demand in this country.

D. H. Burnham, of Riverside, who gives especial attention to this fruit, sent samples of his lemons to H. E. Van Deman, Chief of the Pomological Division of the Department of Agriculture at Washington, and received the following report concerning them. This will apply to California lemons generally, where proper care is paid in growing, picking, and curing them:

D. H. BURNHAM, *Riverside, Cal.*

WASHINGTON, D. C., September 3, 1892.

DEAR SIR: Yours of the 28th ultimo and the two boxes of lemons received in the absence of Professor Van Deman, who is now in Colorado. These specimens are very fine. The color is better than any others that I have seen, and better than many of the imported lemons now in market. If you can produce this crop in large quantities so as to establish its reputation in the market, I think you will find it exceedingly profitable. We have just made a rough test with specimens from this lot which you sent, and other specimens secured at one of the leading groceries in this city, which cost in the New York market \$8 per box of 300 by actual count. We selected specimens of exactly the same weight, and find that the California specimens yield fully 33½ percent more juice, is much more free from rag, and has a thinner skin than the imported garden-grown, velvet-skinned Sicilian lemon. I think it would be well for you to place some of your fruit in the Eastern markets, with a view to opening the trade and creating a demand for the fruit that will stimulate your people to plant more largely of it. Permit me to thank you for your kindness in this matter, and to say that we will be glad to be of service to you in any way possible in the future.

Very truly,

W. A. TAYLOR,
Acting Pomologist.

G. W. Garcelon, whose experience and success in lemon culture are well known, in his report on the lemon, published by this department, lays down explicit rules for its treatment. This report has been widely circulated, and has done much toward giving a forward impetus to this important branch of fruit growing. The following are the rules given by Mr. Garcelon, condensed from this report:

Select the highest and driest part of your citrus orchard for the lemon. Lemons require a location comparatively free from frost. Each locality and each orchard should produce that to which it is best adapted.

See that the ground is properly leveled. Break up deeply, so that the roots of your trees may have the benefit of subsoil. Plant not less than 25 feet apart each way. Dig holes 2 to 2½ feet in diameter. Have your trees taken up with soil, and be sure that the roots are properly sacked. Cut clean from ball of soil all mangled roots. As the growth of the lemon is more rank than that of the orange, it suffers more injury from exposed or bruised roots. When the hole is nearly filled, run in water and finish by putting on a few shovelfuls of dry dirt after the water has soaked away. Plant at the time the tree is starting its new growth, in March or April.

The Lisbon is a favorite for rapid growth and form of tree, profuse bearing, well-shaped, uniform fruit of good appearance, plenty of acid, and good keeping qualities. The Eureka is good, but not so attractive in appearance or so uniform as the Lisbon, and somewhat more tender. All kinds are best when picked from the tree before they are too mature and when the pulp has become fibrous and bitter. It is a good plan to set seedling orange trees and bud after they have been in the orchard a year or two. Time will tell which are the best varieties.

The main points are to remove suckers and shorten in such branches as grow too rapidly and incline to throw the tree out of balance. Every

year clean out any wood that has passed its usefulness, or that is too thick. The best fruit comes from the outside of the tree and nearest the ground.

Lemons on good trees should be picked when two and one half inches in diameter. One half to two thirds the fruit should have attained this size somewhere from October to December. Every three or four weeks the trees should be gone over for fruit of proper size until all is gathered. Color cuts no figure; but for this rule to hold good, the tree must be in good condition and the fruit of proper size and thoroughly gathered at each picking. Pickers should be very careful men, well provided with ladders, and with baskets lined with burlap, each holding 60 to 75 lemons. A suitable wire hook to fasten the basket to the ladder is a convenience. Baskets are very carefully emptied into picking boxes, generally 9 by 15 by 24. The fruit should be carefully clipped, leaving a short stem, and avoiding the least bruise. The fruit should not be exposed to the sun, and should be carried to the hallway of the lemon house on the day of picking.

Herein has been the great difficulty hitherto in making lemon culture a commercial success. The essential features of the curing house are plastered rooms inside a closely-boarded and ventilated structure. A hallway runs around these rooms, giving easy access and providing a place where the fruit can be stored for a few weeks until it has thrown off the excess of moisture, and the injured fruit has had time to develop imperfections so that it may be rejected, and avoid injury to the others. Inside rooms of the house should have tight doors and arrangements for ventilation.

First store fruit in outer hall, and after the excess of moisture has passed away (say four weeks in winter and two in summer) place them carefully on trays, only one deep, and stack up the trays in the inner room. Raisin trays are often fitted up with extra cleats for this purpose. They are kept on these trays four to ten months, until ready to market.

Lemons thus treated have been favorably received by the trade, and have brought fancy prices, reversing the former prejudice against California lemons, mainly occasioned by former improper curing. There still remains some uncertainty as to the fruit reaching market in uniformly good condition. This is one of the problems of the transportation question which we hope may receive an early solution.

THE APPLE.

Apple growing is a more important industry in California than is generally believed. Careful estimates show some 10,000 acres planted to this fruit in our State, and very large quantities are exported. Our principal foreign markets for apples are found in Australia, the Islands, and Central America. In a very large part of the State the apple is the principal fruit grown. Del Norte, Humboldt, Siskiyou, Modoc, Lassen, Marin, and Santa Cruz Counties are all large producers, and the fruit grown here possesses as good eating, keeping, and shipping qualities as that of the Eastern States. All through the Sierra Nevada and the Coast Range there are large bodies of land eminently suited to apple growth, and wherever it has received proper attention it has amply repaid the care bestowed in its cultivation.

As indicating the importance of the apple industry in the northern

part of the State, Humboldt reports shipments in 1891, 547,600 pounds; Del Norte, 330,000 pounds; Siskiyou, 420,000 pounds, and Lassen, 200,000 pounds, giving a total of 1,497,600 pounds from these four counties. The crop of Del Norte and Humboldt Counties finds its market principally in San Francisco; that of Siskiyou is shipped to Idaho, Montana, and the Eastern States, while Lassen ships to various points in Nevada and also to Southern California.

The largest apple orchard in the State is that of Senator F. C. De Long, at Novato, in Marin County, and covers 150 acres of land. The larger part of the output from this orchard is shipped to Australia, where it arrives at a season when the native crop is out of the market.

Another large apple-producing county is Santa Cruz, and very large quantities of Santa Cruz apples are sold in the San Francisco market. In all the mountain counties the apple is the principal fruit crop, and in most of the foothill counties it is an important factor, while even in the valley counties and in Southern California it holds an important position.

As our State becomes more densely populated, as the lower lands become absorbed, the large holdings cut up and settled, population will be forced to the mountain valleys and cañons, and then apple culture will take a prominent stand in California horticulture. It flourishes at high altitudes, and our best fruit is grown there, and our mountain ranges are filled with localities suited to the apple, which now lie idle for the reason that cheap land within reach of civilization and near the great centers of transportation can be had, and this land is generally more fitted to other fruits than to the apple.

Reports from all parts of the State indicate a shortage in the apple crop this season. Like other fruits, the apple was injured while in bloom by late rain and severe weather, which chilled the young fruit and caused a great deal of it to fall. As a result the crop will not exceed two thirds of the average.

THE APRICOT.

The apricot did not give a full crop this season, and in some portions of the State this shortage amounted to a total failure. Taking the entire State, however, it can be reported as fair. In the principal apricot sections the extra size of the fruit almost compensated for the lack in quantity.

At the Sutter cannery 145 tons of apricots were put up this season from fruit grown in the vicinity, and Manager Pratt, in speaking of them, stated that it was the finest fruit ever put up by the company, being extra large and uniform in size.

In Santa Clara County the apricot crop did not develop as it promised, and prices advanced rapidly and almost wildly, running from \$30 per ton for drying fruit to \$35 and \$40, and for special order a still higher price was paid, \$45 to \$50 in some cases.

Commenting on the shortage in the apricot crop of Santa Clara County, the San José "News" of August 4th, said:

"The apricot harvest is now practically ended, and a pretty fair estimate of the crop can be made. It is quite apparent that it is not, by a great deal, as large as was expected. Those who have visited the different fruit districts have been impressed with the deserted condition

of the drying grounds. Many of them are entirely destitute of fruit, while others, that are usually crowded for room, present but a beggarly array of empty trays. Several of our public driers have been accustomed to depend on the culls of the canneries for their fruit. Ordinarily this source has afforded them an ample supply; but this season it is different. The canners have let go of nothing that they could possibly pack themselves, and the driers have had to go without. It is a fair estimate to say that nine tenths of the dried apricots of this season are in the hands of the growers. This practically places the dried apricot market in the hands of the producers. Two years ago there was a better crop here, and the Eastern orchards were not near so great a failure as this season. Then apricots went up to 18 cents. With the present barrenness of the market and the shortness of the crop, there is no reason why the price should not be still higher. There is no cheaper fruit that can be used as a substitute to keep down the price. In the East the apple crop, which has always been the most successful competitor with our dried fruit, is a most complete failure, and will not be recognized as an antagonist this season. It is likely that a very much larger proportion of the peach crop than usual will be absorbed by the canners, as has been the case with the apricots. It is also certain that the shipments of green peaches will be very largely in excess of those of last year. Thus, the end of the peach harvest is likely to find us with little or none of the crop dried. Prunes are, in fact, not half a crop, and the price will be in proportion. Everything indicates that none but the rich can eat dried fruit this year, and that even they will not be able to get all they want, no matter how high they bid."

From Hanford, in Tulare County, comes a report of the satisfactory crops of apricots in Lucerne, and this statement: "Every man with an orchard of this fruit feels his bank account growing." In the Lucerne section the apricot crop this year has been about three times as large as in 1891, and there has been a good deal of competition among apricot buyers, resulting in an average price to producers of about 9½ cents per pound. From Pasadena, Los Angeles County, comes also the news that this year's apricot crop is thought to be the largest ever known in that valley. Says the Pasadena "Blade": "A ride through the apricot orchards reveals an interesting sight. Broken branches everywhere betray the fact that the trees are overloaded. Pickers are everywhere at work, and here and there are gangs of girls and boys engaged in pitting fruit for progressive ranchers, who prepare their own product for market. One man, living between this city and Tustin, has 300 tons of apricots on 25 acres. This is a yield of nearly \$200 per acre."

This allowing apricot trees to overbear, however, is not considered wise by some of the more northern successful raisers of this fruit. One of the orchardists of Vacaville recently stated that the Southern Californians hate to pull green fruit from their trees. Perhaps this is so. But at least the most successful orchardists around St. Helena, San José, and Vacaville think it wise to thin out their fruit, and so by preventing the apricot trees from overbearing, obtain steady returns every year. This practice is the result of years of raising fruit, and while it may seem alarming to think of tons of green fruit being thrown away in Central California, yet the apricot grower has method in such madness.

A correspondent of the Pomona "Progress," a short time ago, endeavor-

oring to inform Southern Californians of the apricot custom of Central California, said: "In the great Spencer orchard of 135 acres at St. Helena, I saw seventy men at work thinning the fruit. I saw fully twenty tons of young green apricots that had been pulled from the trees, and was told that as much more of the green fruit would be taken from the branches. I saw a small army of men and boys in the hundreds of orchards about Vacaville, all pulling green apricots and peaches from the trees, and there were big piles of the young fruit in every orchard. In San José I saw literally hundreds and hundreds of green apricots and peaches lying under the trees, where they had been thrown by the men who were employed to thin the crops."

All this is done because the orchardist thinks it better to have large, plump apricots than a greater quantity of small fruit.

Apricots are really a California possession. No other State in the Union can claim to have so good, constant returns from this fruit. In 1889 Southern California received \$280,000 for its apricot crop. The fruit does well in many of our counties, especially in those along the coast. Some of the extreme northern and eastern sections of the State are shut out from reliable crops on account of the high altitude allowing late frosts to attack the apricot. Last year the Fresno "Republican" said that there had always been a question among the fruit growers of that county as to whether the soil and climate were exactly adapted to the successful growth of the apricot. For several years the Fresno County apricots had not been of such a quality as to warrant shipping them in quantities to the East.

The Royal and Moorpark apricots are looked upon with a good deal of favor by growers here. Last year the Agricultural Experiment Station of the University of California analyzed a wonderfully sweet variety of small, early apricots received from Tulare, the juice being found on analysis by the copper (inversion) test to contain $13\frac{1}{2}$ per cent of sugar. The apricot was thought to perhaps be the "Pringle" variety, and the report of the station said that the result, $13\frac{1}{2}$ per cent, was the highest but one—16.5 per cent—that the analyzers could find on record for apricots, the usual average being about 4.69 per cent in the whole fruit of European varieties. This figure, 4.69 per cent, however, did not refer to fruit grown in California, and the analyzers at the University Station did not yet know what is the usual percentage of sugars in the California standard canning and drying varieties of apricots.

It has been suggested that apricot growers who have collections including a number of varieties, take notice as to how different varieties are affected by the shot-hole fungus, and report in due time which varieties are the most injured, and which, if any, are little affected. We are led to make this suggestion by an item in a South Australian paper, which describes how Mr. Westerman Smith advances the proposition that instead of trying to combat the shot-hole fungus of apricots, it would be better to grow varieties that are nearly free from attack, such as Oullin's Early Peach and Princess Orange. The first he had grown for five years and the latter seven years, and nearly free from disease, which has been present in the orchard three years. Over 85 per cent of clean fruit was yielded by the two varieties, without any cost for fungicides. Of the twenty sorts of apricots cultivated, only two or three were of any value.

One of the varieties named by the Australian observer is hardly

known in this State, and the other is not on record at all. But if they resist, there are probably others known to our readers which are also resistant. Our observation is that there is considerable difference in the severity of the attack, both with apricot and plum varieties, but we have not looked into the matter as closely as we shall in the future. We trust others will do the same, and see if a test can be made of varieties satisfactory in season, size, and bearing, which do not yield to the shot-hole. It would be a consummation greatly to be desired.

THE CHERRY.

The cherry crop of 1892 was from one half to two thirds of the average yield. The sap was chilled by the late rains and cold weather, and the fruit did not ripen so uniformly as usual. Alameda County, from the northern boundary line to Niles, is the great cherry section of the State, and through all this region not over half a crop was reported. Following close upon Alameda, as a cherry producer, comes Santa Clara County, and then, in order, Solano, Napa, Placer, Sonoma, Santa Cruz, and Sacramento. Very few cherries are grown in the San Joaquin Valley counties, and for many years it was accepted as an undeniable fact that it would not flourish in the southern counties; but experiments made in this section of late upset that idea, and leave it possible that with a careful selection of varieties adapted to the climate, with suitable soil and careful attention, the cherry may be made successful. At Ontario, 100 cherry trees at the upper end of Euclid Avenue produced this year 2,838 pounds of fruit, which sold at 10 cents per pound, realizing \$283 80. It is stated that the trees had not been irrigated for two years, and had only one cultivation within the past year.

J. E. Lanterman, of La Cañada, in Los Angeles County, sent to the Los Angeles Chamber of Commerce clusters of as fine cherries as were sent from the north, with the statement that he had an acre and a half of trees that were loaded, from two of which he had picked 200 pounds, and so heavily were they loaded that it was hard to tell that any were taken from them.

Mr. James Birch, of the upper Yucaipe Valley, in San Bernardino County, has a little less than three fourths of an acre in bearing, and the yield this year was 6,000 pounds, the entire crop being sold in the local market at 10 cents a pound. The yield last year was 6,260 pounds. The varieties are Black Tartarian, Lady of the Lake, the Great Bigarreau, and Napoleon Bigarreau.

Writing of the cherry in Southern California, A. H. Judson says:

"The bearing cherry trees, growing at an altitude of about 5,000 feet, are on a small plot of ground not more than an acre in extent, surrounded by hills. The ground is naturally rather moist, and contains two or three springs, and the location is quite frosty.

"Two varieties of cherry are growing there, one a black and the other a whitish-yellow cherry, slightly shaded with red. Not being an expert in cherry growing, I cannot vouch for the true names of these cherries, but have supposed one to be the Black Tartarian and the other the Yellow Spanish.

"These trees must have been planted fifteen or twenty years ago, judging from their size, and for many years have had no care whatever. Cattle and horses graze about them and rub up against them, and gophers

and squirrels have full sweep to the roots, and have ruined some of the trees. Notwithstanding all this neglect, there are fifteen or twenty trees still growing, which blossom full every year and bear heavily, except when nipped by frost.

"That the cherry is a success in that particular spot admits of no reasonable doubt. Whether it will prove as much of a success on my 'Highland Home' property, 2,000 feet below, is another question.

"My trees there, on disintegrated granite soil, have been planted between four and five years, and bore some very fine fruit. I have much confidence in the ultimate results of my efforts to grow cherries in that place, but I suppose it will require at least four or five years more to give the matter anything like a fair test."

THE FIG.

Very great interest is being taken in fig growing and packing, especially in the southern part of the State, where large bodies of new land have been set to this fruit in the past few years. While the fig as yet does not hold a place of commercial importance in our State, it promises in a few years to take a prominent position among our fruit exports. Numerous experiments in growing and curing are being made in different parts of the State by individuals, and some of these give marked promise of success. In aid of this industry this department has distributed a large number of cuttings of the genuine Smyrna fig, and later a number of rooted trees. These were procured direct from Smyrna, and no question of their genuineness can be raised. These have been distributed to different sections of the State, and while as yet too young to give any returns, reports from them so far as received are very encouraging.

At the California Experiment Stations much and careful study has been paid to this branch of horticulture, and a bulletin was issued early in the present year setting forth the results of their experiments. It contains much valuable information for the use of the fig grower, and is on that account given below:

"The fig promises to become one of the most important fruit trees of California. But the culture of this fruit belongs chiefly to the borders of the Mediterranean, especially Asia Minor, and much less is known here about varieties and their treatment than is the case with the more common deciduous fruits. The numerous discussions upon the fig, in recent years, prove the existence of a strong and growing interest in the subject. It was therefore decided to stock the stations with every distinct variety of fig, and to observe the growth, hardiness, quality of fruit, and other elements of importance.

"There are about fifty varieties growing at the various stations, and some additional sorts are still in nursery rows. The smallest stock is at Pomona, but it will be increased this coming season to an equality with the stations earlier established. The following list shows the varieties now growing and studied in the preparation of this report:

Agén.	Barnasotte Gris.
Angelique.	Brown Ischia.
Abondance Précoce.	Brown Turkey.
Brianzola.	Black Brogiatto.
Black Ischia.	White Brogiatto.
Brunswick.	California Black.
Black Bourjassotte.	Col di Signora Nero.
Black Marseilles.	Drap d'Or.

Dalmatian.
Dorée Narbus.
De Constantine.
Du Roi.
White Dottato.
Black Dottato.
Early Violet.
Guigliano.

Grossale.
Gros Gris Bifere.
Grizzly Bourjassotte.
Hirtu du Japon.
Ladora.
Monaca Bianca.
Negra Larga.
Osborne Prolific.
Pasteliere.

Royal Vineyard.
Ronde Noire.
Ronde Violette Hative.
Raby Castle.
Rocardi.
Rubrado.
Smyrna No. 1.
Smyrna No. 2.
Smyrna No. 3.

Smyrna, Wild.
San Pedro.
Sanvito.
Trojano.
White Bourjassotte.
White Genoa.
White Adriatic.
White Marseilles.

"The first season after the figs were planted at the different stations, many differences in growth and in adaptation to climate began to be noticed. The varieties showed a greater range of variation in respect to their power to resist cold than any other semi-tropic fruit. The problem that naturally presented itself was this: How do the various sorts compare in point of hardiness and relative endurance? The colder districts of the State desire to grow figs, if possible, and need the varieties that are most hardy. Then, also, we may expect to produce still more hardy seedlings from hybrids of certain sorts, or by fertilizing the finer table figs with the wild Smyrna. In a few more years, when all the varieties being grown are in bearing, the comparative value of the fruits can be tested. At present the problem of hardiness requires attention.

"On December 17th and 18th I examined the growth of the fig trees at the San Joaquin Valley Station at Tulare. Forty-two varieties are now represented there, to which the wild or Capri fig, and several new sorts imported last year, will be added. The fig trees are planted in avenue form, and in the present unsheltered condition of the station it cannot be said that there is any difference in temperature between different portions of the avenue. In the course of time, when the orchard is fully developed, the avenue will be less exposed to the wind. But the Tulare region is subject to as great a range of temperature as any other part of the San Joaquin Valley. There seems to be a basin about the lake into which the cold air settles, and it is doubtful whether rows of forest trees will be of as much service here as in some other localities where the cold is due to air currents that may be broken.

"The fig trees at this station were mostly planted in the winter of 1888-89. Some died, having been set in alkali spots, and were replaced. The worst situations have now been treated with gypsum, about 10 pounds having been put around each tree. Owing to the differences of soil, a very great difference in the growth of trees of the same age is manifest. This, of course, is complicated with the difference naturally belonging to the growth of different varieties. About twelve of the varieties of figs represented bore fruit last season (1891). Du Roi, a new variety little known in the State, was one of the best of these, and attracted much attention.

"All the fig trees received some irrigation, but not a drop of water was allowed them after August. The first heavy frosts in November took off all the leaves. The wood appeared well ripened in most cases, except, as usual, the extreme tips of 'water sprouts' and late growths. It was therefore a surprise to the foreman when some of the trees showed the effects of the early December frosts (temperature, 22°). Certain varieties appear to suffer, and it does not seem to be a question of alkali or cold currents; for, as previously stated, the whole tract is subject to identical conditions in this regard. Besides, trees of the same kind, one

of which stands on sandy soil and the other on alkali, seem to suffer to a similar extent.

"Of the older varieties (older in point of introduction to this State) the California Black is not to be ranked as high in the matter of hardiness as was to be expected. It can only be called 'medium;' the White Ischia stands somewhat better; the Dalmatian does fairly well; the Black and White Marseilles, which, unfortunately, are rather small for table use or for drying, do even better than the Dalmatian. The San Pedro, a fine table variety much liked by growers, suffers greatly, even branches of half an inch thickness being frozen. The two Smyrna varieties have stood the frost well. The Brown Ischia has suffered more than the Black California. The three Bourjassottes, black, white, and green, together with the White Adriatic, are able to withstand the cold.

"Among the new varieties, the Du Roi, previously alluded to, is one of the most hardy. Ladora, an excellent fig, is badly frosted, but not enough to justify discarding it as yet. Col di Signora Nero is so much frozen that it must be cut back nearly to the ground next spring. One of the worst cases in the avenue is that of the Gros Gris Bifere, which is certainly not hardy enough for the station. Ronde Violette Hâtive is a fine fig, but slightly frosted, and probably safe when older. De Constantine and Drap d'Or have done well. Abondance Précoce suffers a little; Royal Vineyard ranks but medium. The most hardy fig at the station, and the only one that shows no sign of frost anywhere, is the Dorée Narbus, one of the new importations. There are two trees of this variety in different parts of the grounds, one in alkali, the other (near the orange trees) in sandy soil. It has compact growth, hard, dark bark, short joints, and small buds. The leaves are dark and rather small. It has not yet fruited, but if it proves to bear well and to be of fine quality, it can be recommended for frosty situations.

"To sum up these observations, there are two or three sorts being tested that seem unlikely to stand the climate. Possibly ten sorts show appreciable loss of young wood. All the others, except the Dorée Narbus, show some slight effect of frost upon the soft, late growth, but not, except as above noted, enough to affect their orchard value to the region.

"The fig experiment at the Southern California Station, near Pomona, is less advanced than any other, since trees were only planted there last spring. It was hoped that all the varieties would prove hardy to Pomona, and at first it appeared that they would do so. But this month (January) many varieties have suffered from frost. The complete comparison with Tulare and Paso Robles cannot yet be made, for the list of varieties is incomplete at Pomona. But the following sorts proved hardy: Du Roi, Monaca Bianca, Hirtu du Japon, Agen, and Col di Signora Nero. This shows that more varieties out of the complete list of fifty-one will thrive at Pomona than at Tulare or Paso Robles. Twelve varieties, mostly new, and very small trees with immature wood sent to the station for growth for a year in nursery rows, were severely frozen, in some cases 'nearly to the ground.' This, however, is not evidence against future success with many of these varieties. The following trees suffered much from frost, and are probably unreliable in this part of the valley: Gros Gris Bifere, Grizzly Bourjassotte, Ronde Violette Hâtive, and Negra Larga.

"At the Southern Coast Range Station, near Paso Robles, where the

same varieties of figs are growing, the problem is further complicated by the fact that there is much difference in the soil and location of the trees, the avenue passing through a low swale that is much more frosty and has a more compact soil than the rest of the tract. Most of the trees were planted at the same time as those at the Tulare station. They received no irrigation. Those in the most exposed positions were wrapped in straw to protect them. January 4th the straw was taken off so as to make a thorough examination, and put back again.

"Among the figs on the high land were the Black and the White Bourjassotte, the two varieties of Smyrna, Ronde Noir, Brunswick, Col di Signora Nero, Angelique, White Ischia, Agen, and Pasteliere. All did fairly well except the White Ischia, which was badly frosted. At Tulare, also, the White Ischia was more tender than the Bourjassottes. The only marked difference between the two stations in this group was in the case of Col di Signora Nero, which nearly escaped frost at Paso Robles, but was very badly frosted at Tulare.

"Continuing along the avenue toward the swale, under less favorable conditions the White Adriatic, as at Tulare, proved fairly hardy, and grew well. A small tree planted in 1890-91 suffered somewhat. The Dalmatian was only a little touched with frost. Drap d'Or, on quite low ground, suffered much. De Constantine, as at Tulare, made a strong growth, and nearly escaped frost. A Smyrna, planted in the swale in 1890, gave an opportunity for comparison; it was considerably frosted, but not nearly as much as some other varieties. The Black Marseilles, which did well at Tulare, was 'cut right down' to the ground with the cold. California Black, as at Tulare, was not in the front rank, only 'of medium hardiness.' Brown Ischia, as at Tulare, must be placed below the Black Californian. Early Violet, which did fairly well at Tulare, was severely frosted here. Dorée Narbus, the most hardy of all at Tulare, 'withstood the frost,' though in one of the lowest and most exposed situations, but 'has grown little.' Hirtu du Japon was also hardy. Gros Gris Bifere, which was one of the most badly frosted sorts at Tulare, was also very severely frosted here. So was the San Pedro and the Monaca Bianca. The last three were on adobe soil.

"The foreman, Mr. R. D. Cruickshank, writes as regards the general subject that 'some varieties are on adobe, some in the swale, and some on the higher and drier lands,' as before stated. He adds: 'The kind of soil they occupy has much to do with the maturity of the shoots in autumn, and their ability to withstand the frost. I notice that those on the high ground have always suffered least, while none of them have been very severely frosted this year.' The thermometer went down to 18° one night this season, and to 20° on another. The figs have been touched regularly with frost every spring and fall since they have been planted, and on the whole have not done very well: 'They do not occupy a very good piece of land, and at first had a hard struggle with the gophers.' For this reason it has been decided to remove from the swale those varieties that do not withstand the frost there, and plant them on higher land.

"The result of the experiment can be summed up in a few words: The fig is not an entire success in this region, unless the location is carefully chosen. It must be high and protected from severe frosts. When the swale on the station tract is more fully underdrained, figs will do better there, but it is not the place one would choose for a fig orchard.

A tract 200 or 300 feet higher would give better results. For family planting it would seem that the Smyrna, White Adriatic, Dorée Narbus, and several others to which allusion has been made, are here among the more hardy sorts.

"At the Sierra Foothill Station, near Jackson, Amador County, the figs are planted so as to encircle a hill. Some of them are only 25 feet above the lowest point on the grounds—the bank of the mining ditch; others are nearly at the top of the hill. They occupy several classes of soil—the red (slate) and the granitic, but few are on the pure granite soil. The foreman, Mr. George Hansen, writes that the leakage of the large reservoir on the top of the hill might have reached a few of the figs, but that the finest trees are entirely out of its reach, and none received any intentional irrigation. We have here a fine practical illustration of the suitability of fig culture to the rocky foothills of similar regions.

"It is worthy of note, further, that the olives occupy the warmest part of the reservoir hill. The lowest temperature on record at the ditch is 20° F. Twenty-five feet is a small elevation, but it is likely that it makes a difference of several degrees in such a locality. When a few trees are planted on the newly cleared land beside the ditch, for the purposes of comparison, the list of hardy varieties may be lessened. At present, as the foreman writes, there is not a single variety that shows signs of having suffered from frost this season. Some trees mature late, and the wood is still green, but sound. Two kinds, Du Roi and Brown Ischia, both at the top of the hill, kept their leaves later than others, so the leaves were frozen, but that did not affect the wood. Practically, none of the fifty-one varieties of fig at the station can be called other than hardy, as now planted, above the valley.

"One point worth comparison with the other stations is that of growth. Dorée Narbus, noted as being especially hardy elsewhere, but as of slow and poor growth, is 'gigantic' at the Foothill Station. Other superb growers are Brown Ischia, De Constantine, Monaca Bianca, and White Adriatic. The following sorts can be called first-class growers, though not equal to the first named: White Genoa, Du Roi, Early Violet, Col di Signora Bianca, Bourjassotte Grise, White Ischia, White and Black Marseilles."

THE OLIVE.

This is another fruit to which great attention has lately been paid, and with good success in our State, and to the growth of which very large areas of land in the State have been devoted. The olive has been grown in California from the date of its earliest settlement by the Mission fathers, and one of our standard varieties is known as the Mission. The tree does well over the greater part of the State, and will flourish in places where other trees could hardly establish a foothold. It repays care and attention, however, as well as any orchard tree we have. The cultivation of the olive and the manufacture of its oil became of such importance that it was deemed advisable to organize the growers into an association for the advancement and protection of this great industry, and on July 8, 1891, a meeting was held in the rooms of the State Board of Horticulture, and an organization effected. An association label was adopted for their oils, and Justinian Caire, of San Francisco, was appointed agent of the association. A Board of officers for the year

was elected, and the membership was divided into two classes: active members, being those actually engaged in the commercial production of oil, and honorary members, being those engaged in olive growing, but who have not packed oil for the market. So soon as an honorary member becomes a producer of oil for the market he is entitled to full or active membership.

The second annual convention of olive growers was held at the rooms of the State Board of Horticulture on July 21, 1892, and the following-named gentlemen were elected officers of the association for the ensuing year:

Ellwood Cooper, Santa Barbara, President; Frank A. Kimball, National City, Vice-President; Justinian Caire, San Francisco, Treasurer; B. M. Lelong, San Francisco, Secretary. Directors: Ellwood Cooper, Santa Barbara; John Bidwell, Chico; Frank A. Kimball, National City; E. E. Goodrich, Santa Clara, and John C. Gray, Oroville. Reports of progress were made and a number of interesting papers were read.

President Cooper, in his opening address, touched on the difficulties experienced in the introduction of pure oils, and the necessity for legislation to guard the purity of food substances. He said:

"The Olive Oil Act, as passed by the Legislature, has been in a great measure inoperative. The adulterated olive oils, or the sophistications that were exposed for sale, were simply relabeled, substituting the words 'salad oil' for olive oil. These labels were placed over the former labels, and the oil sold as salad oil, at the same price and under the same false statements by the dealers as before; and so long as consumers are not aware of the dangerous admixtures imposed upon them by false representations, or that sufficient legislation cannot be had controlling absolutely the character of food products, so long will this law be violated; it is incumbent upon us to promulgate such information as must deter all intelligent people from being deceived by adulterated compounds.

"The Act to regulate the practice of pharmacy, as approved March 11, 1891, has not met with any better success, for the reason of a serious defect in the condition of its enforcement.

"The Commissioners appointed by the Governor to carry out the intent of this important Act had several meetings, and were organized and ready to perform the duties imposed upon them; but the following clause practically made it a dead letter (page 86, Statutes of 1891):

SEC. 9. On written complaint being entered against any person or persons charging them with specific violation of any of the provisions of this Act.

"Any one familiar with modern litigation will be very slow to make a complaint.

"I conceived the idea of introducing pure olive oil into all the drug stores throughout the State, and engaged a druggist familiar with the trade to travel from place to place to sell my oil. He was met with open disregard of the law, and the statement that they would not comply until they were forced to do so. In other words, they intended to go on compounding prescriptions with adulterated articles, regardless of the result upon the unfortunate individual who took them. In other matters of far less import the law deals differently; for example, take our banking laws. Persons organizing a bank to do business have to take the oath that they will comply with the Banking Act, under which

they organize. A bank examiner, duly authorized, with competent knowledge and expert training, has the power to enter any bank at any time, without notice, and examine all the securities and affairs of the bank, and in the event of discovery of non-conformity with the written law, or insecure transactions, can close the doors and compel liquidation. Does anybody complain of this? Does it interfere in any way with public business?

"I propose that we appoint a committee to look after legislation at the coming session, and that we endeavor to have the Pharmacy Act so amended as to strike out that part of Section 9 that I have read, and insert that a certain number of drug inspectors shall be appointed, with a sufficient salary and traveling expenses, sworn to do their duty, and clothed with all the power of a bank examiner.

"To amend the olive law by including all food products.

"That every food product exposed for sale shall contain on the label (1) the name of the manufacturer or compounder, with the place of manufacturing or compounding; (2) the name and actual percentages of the different ingredients composing the article, and (3) the actual quantity, if liquids, contained in the package, and if solids, the actual weight.

"Does anybody presume that such laws would be unjust, or interfere with honorable trade relations?

"The expense involved in maintaining the inspectors would not be the one hundredth part of the amount that is now swindled out of the consumers by the infamous practice of adulteration. It is due the wageworkers who are engaged all their time in the struggle for existence, and who may not have the knowledge or the time to inspect the deleterious articles that are dealt out to their families at every store at which they deal. It is due all classes that they should be protected from noxious or poisonous mixtures. It is the duty of every intelligent being to throw all his power in the line of arresting this most monstrous evil.

"Inspection laws controlling staple products have been in force ever since the foundation of our Government; to enlarge or extend such regulations is compatible with the spirit of our republic, and no abridgment of our liberties to do right. To do wrong, yes, we have special laws to control counterfeiting, to control forgery, and most rigid sanitary laws to prevent the spread of dangerous diseases. Adulteration of food products is counterfeiting and forgery, and aids the spread of epidemics. By adulteration a man is made sick, and by it he is prevented from recovering.

"The Pure Food bill now pending before Congress, and which will probably become a law of the land, will aid us in enforcing in our State the most stringent measures against adulteration. All imported food products, and all such articles brought from sister States, will be, or can be, controlled by the provisions of said Act."

THE PEACH.

The peach has always been a favorite fruit in California, and a profitable one. In our foothill and valley regions it attains its perfection, and is subject to fewer drawbacks than in most parts of the Union. Very large areas of peach land in the Eastern States have been devastated by the ravages of the yellows and rosette. As soon as it was

known that there was danger of these diseases being introduced into our State, stringent quarantine measures were introduced and enforced, and as a result, neither of these dread diseases, which have ruined such large sections of the older peach countries of the East, have obtained a footing in our own State.

Faith in the peach as a paying crop is still holding its place with our orchardists, and this is evidenced by the fact that there are now 55,000 acres in this fruit in the State, of which over 21,000 acres are new plant, not yet in bearing.

The large demand for peaches for table use, drying, and canning, and the high prices received for them, amply justify their cultivation in large quantities. The demand is a steady increasing one, and as the peach area of the East becomes more circumscribed, the demand for California peaches will become greater. The heaviest planting of peaches this season has been in the counties of Santa Clara, Solano, Tehama, Tulare, Los Angeles, Placer, and Kern. In the last named county a great deal of attention has been given the peach in the past few years, and the results have been highly gratifying.

The peach crop of 1892 throughout the State has been light, averaging about two thirds of the usual output. This was occasioned by late rains and severe cold weather which came when the trees were in bloom. In some sections the crop was a total failure. These, however, were few. In many portions half a crop was reported, and in others it was very heavy. The shortage was heaviest in the northern and northeastern counties, decreasing toward the southern end of the State. In sections where the shortage was but partial the extra size of the fruit went far toward making up the loss, while the strong advance in prices which took place soon after the fruit began to ripen amply compensated the grower for his shortage.

This year has produced several seedlings which seem likely to extend the peach season in the line of fine yellow varieties. At a meeting of the State Horticultural Society, Fred. C. Miles, of Penryn, exhibited two notable seedling peaches. One was a very large yellow cling, rich and handsome, ripening 10 days later than Salway. Another of about the same date of ripening was a very large, beautiful, yellow freestone. Both are seedlings of Mr. Barton, whose name they will bear. Their great size, late ripening, and excellent shipping qualities bid fair to make them notable in the future.

A fine yellow freestone, which seems to be a few days later than these, has been brought to light by C. W. Albright, of Placerville. It is not so large as the Barton, nor quite such a brilliant yellow color. It is, however, of good size, with rich, yellow flesh of high and true flavor. The samples were picked October 5th, stood shipment to San Francisco perfectly, and have remained several days since receipt in perfect condition. The variety promises to have a future if its bearing qualities are satisfactory.

R. W. Bell, of the Santa Rosa nurseries, produced a peach which he names the Wonderful, fruit from which was picked as late as September 26th. It is a medium-sized, yellow freestone, rather oval, keeps well, and is satisfactory in interior qualities.

W. T. Kirkman, nurseryman at Atwater, Merced County, also has a good, yellow freestone, ripening last of September, which has originated in his neighborhood. It is a very symmetrical, handsome fruit of good

quality. Though of good, medium size it should be larger to compare well with the other seedlings of the same or later season mentioned above. It is certainly worth attention, and may prove very valuable locally, at least.

THE PEAR.

The season's pear crop is reported as very nearly up to the average. In some few localities there was a shortage, but this was not nearly so heavy as in the case of stone fruits. The pear is one of the standard fruits of our State, and the Bartlett has given us a reputation for pear growing. Owing to the peculiarity of the pear in ripening best off the tree, and its consequent availability for shipping over long distances, it was the first fruit exported from California, and served as the pioneer for the gigantic trade which has since sprung up in California fruits. Unlike many of our fruits, there has been no boom in pear growing, but a steady and continuous growth has characterized it from the settlement of our State. It was one of the fruits introduced by the Mission Fathers, and trees of their planting may still be found in the State.

Naturally, when Americans began to plant in the early fifties, they also planted pears, securing the best sorts obtainable, and from that time to the present the pear has received a fair share of encouragement.

There are now nearly 23,000 acres in pears in the State, of which 8,236 are not yet in bearing. It is a hardy grower, will do on almost any kind of soil, but prefers a heavy alluvium, moist, but well drained. Its returns are almost certain, and there is always a good market for the crop. A very material advance in the price of pears this season promises to give a great impetus to this branch of horticulture, and a large amount of new land will be set to pears the coming season.

The Bartlett is the pear of California. Sweet, juicy, delicious, handsome, even when grown in New York or other favorable Eastern locations; all these qualities are increased in California, where the size and amount of sugar developed in this fruit is phenomenal.

Being a summer pear it must be picked for Eastern shipment before it has attained its full size or received its full amount of sugar; so that to enjoy a California Bartlett pear in its highest perfection one must eat it in its native orchard. Possibly the fine refrigerator car service of to-day may make it possible to pick them here in full perfection and get them through when just right.

The canneries in California buy and use immense quantities of this fruit, and it is one of the choicest of the canned products of the State. The greatest care is used in preparing it for the cans. The operator in halving it is careful to exactly bisect the portion of the stem within the neck of the fruit, and this secures a firmness to this portion which keeps the pieces unbroken even when thoroughly cooked. If people who talk about the carelessness of canneries could only see how careful the young lady operator is with her fruit, which is placed under water at once when prepared, so there may be no discoloration; if they could only see how carefully it is packed into the cans and covered with clear syrup, and how carefully the cooker watches the clock while the great tray of cans is in the great bubbling tank of steam-heated water, they would more highly appreciate the choice fruit when it is opened on their table.

Allowed to become fully ripe and then dried with just sufficient sul-

phuring to prevent discoloration and decay, the Bartlett pear becomes a delicate confection.

There are many other kinds of pears which come to great perfection in California. We shall not attempt to enumerate them, for each has some special good quality to recommend it, but will mention some of the standard sorts that prove very profitable for growth and shipment.

After the Bartlett comes the Clairegeau, which has become quite a favorite with both shippers and growers, and there are quite a number of fall pears that are really good. The Duchess and Easter Beurré grow large and fine for late shipments. The Winter Nelis is a fine winter pear, not large, but of fine quality. In most locations it is getting out of repute with the growers, because of its capriciousness in bearing. Its flowers seem to blast easily. Perhaps with a more thorough use of fungicide remedies this tendency could be overcome. We have never seen pear trees more heavily loaded than the Winter Nelis in some sections of the Sierra foothills. An early winter pear is the Seckel, about the smallest of the commercial pears, but so spicy and delicious that it is a favorite everywhere. We have found this doing finely in the mountains, and bearing enormous crops.

California has originated several noted pears. B. S. Fox, an early nurseryman of San José, raised several new varieties, which have attained a great reputation as "Fox" pears. Of these the P. Barry is perhaps the most celebrated. It is a long, slim pear, of symmetrical shape, and one of the best keepers known. The flesh is free from the granular texture possessed by some pears, and when ripe is smooth, sweet, and buttery. By putting these pears in a cool place they will keep till late in the spring, and their ripening can be hastened by placing in a warm, dark place.

Mr. A. Block, of Santa Clara, has originated and tested many new sorts, being a constant and patient experimenter in that direction, and unless he secures something equal, or superior, to well-known sorts, the world never knows it. He has two varieties—the Acme and Superbe—which have attracted great attention, and when shipped with other sorts have brought largely increased prices.

Almost every neighborhood has a superior pear of local origin. Some of these prove valuable when introduced elsewhere, and others are never known beyond their immediate section. The Idaho is one of these local productions, named from the State from whence it came. It has been extensively introduced, and the verdict will be given after a few years.

The pear is found all over California, and there are here and there locations which claim especial adaptability. Santa Clara was the location of one of the earliest and best of the "Mission" pear orchards, and the portion of Santa Clara Valley about that place has been one of the most noted pear-producing sections of the State.

In some orchards we find trees of the celebrated Pond pear, specimens of which have astonished the world, and won for California a part of her reputation for "big" things. We have seen many specimens weighing 3 pounds, and one or two weighing 4 pounds each. They are a winter pear, and color very handsomely. We have no doubt they will excite great wonder at Chicago next year.

Another great pear region, especially for the Bartlett, Winter Nelis, and Seckel, is in the foothills of the Sierra, at an elevation of 2,600 or 2,700 feet. These varieties of pears we have found to be of more uni-

formly good quality and size, and to bear better crops, than in any other portion of California we have seen.

The mountains of the Coast Range promise well for pears. They will endure a warmer climate than apples, but the temperate climate of the coast valleys, and the slopes of the mountains at quite an elevation seem to be best suited to them.

The area of successful culture is more widespread than one could suppose, and is, we believe, larger than in the case of any other fruit in the State.

The use of the pear can be considerably increased by drying the ripe Bartletts, and by encouraging more fruit dealers to prepare for and receive the California pear in autumn just before cold weather comes, and properly ripen it for their winter trade as they may need. To do this the Eastern dealer should have cold storage facilities, or a cool cellar will do fairly well, and then a warm, dark room in which to ripen as needed. There is much in ripening pears. Nearly all kinds, if allowed to ripen on the tree, are spoiled.

THE PRUNE.

The large yield, ease of growing, and good returns from prune orchards have given an impetus to this branch of fruit growing in the past few years that is almost phenomenal. The prune industry may be said to be the growth of the past decade, for while a small shipment of prunes was made from San José by J. Q. A. Ballou as early as 1867, it was not until ten years after that it had grown into notice, and not until several years after this that it became of commercial importance. In the past ten years, however, prune growing has made wonderful strides, and there are now nearly 50,000 acres in prunes in this State, of which less than one half are in bearing, and not over one fourth in full bearing.

The total output of the State for the year 1891 was 27,500,000 pounds. This was the largest yield for any one year. Early in the spring of 1892 the indications were favorable for a very large crop, and it was confidently expected that the output would run from 40,000,000 to 50,000,000 pounds, but, like all other classes of fruit, the prune was severely injured by the late rains and cold weather, and it is not probable that the present season's crop will exceed 18,000,000 to 20,000,000 pounds.

Prices opened well early in the season, 10 cents being paid for sixties to nineties, sacked and delivered on the cars. A number of orders were placed at that price, when a decline to 9 and 9½ cents took place. This price remained for about ten days, when it again advanced to 10 cents and remained stationary.

The following figures represent the prune crop of this State for a period of five years:

	Pounds.
1887—Cured prunes.....	5,825,000
1888—Cured prunes.....	8,050,000
1889—Cured prunes.....	17,000,000
1890—Cured prunes.....	16,000,000
1891—Cured prunes.....	27,500,000
Total for five years.....	74,375,000

During the same period there were imported into the United States, from Europe, 276,243,746 pounds, as follows:

	Pounds.
1887—Prunes, all kinds.....	92,032,625
1888—Prunes, all kinds.....	70,626,027
1889—Prunes, all kinds.....	46,154,825
1890—Prunes, all kinds.....	58,093,410
1891—Prunes, all kinds.....	9,336,859
Total imports for five years.....	276,243,746

This gives a total consumption of prunes in the United States of 350,618,746 pounds in five years, or an average of 70,123,749 pounds per year.

There are now 49,630 acres set to prunes in this State, of which 25,332 acres are in bearing, and 24,298 have not yet come into bearing. Of those bearing, not over 50 per cent have reached the full bearing age. Of the new plant, a very large percentage was set out in 1891, the plant of 1892 being much less, owing, probably, to the low prices which prevailed for fruit last season, and a growing impression that there was danger of overdoing the prune business.

The principal planting of the past two seasons has been in Santa Clara, Tulare, San Bernardino, and San Luis Obispo.

RAISINS.

The raisin industry has made more rapid strides during the last ten years than has any other branch of horticulture, advancing from a pack of 120,000 pounds in 1873, to 52,831,800 pounds in 1891. The ratio of increase has been most rapid in the past five years, as will be seen from the following table of shipments during the periods mentioned:

	Boxes.	Pounds.
1873.....	6,000	120,000
1874.....	9,000	180,000
1875.....	11,000	222,000
1876.....	19,000	380,000
1877.....	32,000	640,000
1878.....	48,000	960,000
1879.....	65,000	1,300,000
1880.....	75,000	1,500,000
1881.....	90,000	1,800,000
1882.....	115,000	2,300,000
1883.....	125,000	2,500,000
1884.....	175,000	3,500,000
1885.....	475,000	9,500,000
1886.....	703,000	14,060,000
1887.....	800,000	16,000,000
1888.....	1,250,000	20,500,000
1889.....	1,633,900	32,678,000
1890.....	2,341,463	46,829,260
1891.....	2,641,590	52,831,800

The very large profits made in raisin growing drew large numbers into the business, and for a time it looked as though the market was in danger of being overstocked. A warning pamphlet issued by George West, of the State Board of Viticulture, and the very low prices which ruled for this fruit last year, had a salutary effect, and checked excess-

ive planting. As a result the new acreage set to raisins during the present year has been comparatively small.

The present season's crop is far below average, and while there are no authentic returns yet in, it is estimated that it will not exceed two thirds of a crop, and may fall to one half. June reports from the Weather Bureau at Fresno, stated that 75 per cent of the three-year old vineyards in the Fresno district lost all of their first crop, and the remaining 25 per cent would produce only a quarter of the expected yield. In the four-year old (and over) vineyards the loss was from 25 to 60 per cent. It was computed that the total crop of London layers would be 50 per cent short of last year's. Vineyards that have dropped their first crop will have a fair second crop, but it will be late.

These predictions were but partly fulfilled, as the first crop turned out better than was expected, while the second crop was exceptionally good. The result was that while the crop was much lighter than average, it was much better than was at first expected.

Prices were very much better than last year and the demand greater. This was brought about largely by a combination among the raisin growers to maintain prices for their fruit. A meeting for this purpose was held in Fresno on June 22d, at which the following agreement was formulated and generally signed:

"We, the undersigned, raisin growers of California, having become fully satisfied that the present demoralized condition of the raisin market is almost, if not entirely, due to the absence of any understanding concerning uniform selling prices among the parties who have the products of raisin vineyards in their hands for sale, and from the fact that numerous established agencies in the East are in the habit of competing, and thereby underselling each other, without regard to prices, we believe the time is at hand when this system of disposing of our vineyard products will bring the raisin growers of this State to poverty and financial ruin.

"Now, therefore, in view of the facts above stated, we, the undersigned raisin growers, do most earnestly request, as a matter of protection to ourselves and families, even demand, that the packers who are producers of raisins, and packers who are not producers of raisins, and in fact all who have raisins in proper condition for the markets of the world, join together immediately and agree among themselves to establish a minimum price on each and every grade of raisins, and that they bind themselves not to sell any raisins during this present crop year for less than such minimum price agreed upon. And in consideration of such an agreement as above, we, the undersigned raisin growers, hereby agree and mutually bind ourselves upon our honor not to give, sell, or consign any raisins subject to our control, during the term above mentioned, to any party or parties who do not enter into our agreement establishing such minimum prices."

This agreement was afterward circulated among raisin growers of other counties and signed by a large number. A minimum price of 4½ cents per pound in the sweat-box was agreed upon.

When the association was organized it found a very large portion of the raisins of the State had been this year, as in 1891, contracted and assigned to the packer, to be sold by him on commission for the grower. The grower had signed an iron-clad agreement with the packer which enabled him, the packer, to dispose of these raisins at whatever price he might see fit.

One of the first duties of the association was to ascertain at what prices these commission packers were selling the growers' raisins in the Eastern market. About the middle of August it was reported that raisins were being sold by many of the California packers in the markets of New York, Chicago, and Boston at prices that would net the grower considerably less than 4½ cents a pound. Having in mind the deplorable slaughter of raisins last year, the committee of this association caused telegrams to be sent to many brokers in the Eastern States asking for quotations and the names of firms who were quoting prices. The result was that nearly all the packing houses and some of the coöperative societies of the State were found cutting prices.

In answer to the earnest remonstrance of the association, and also with regard to the fact that the indignant grower, when informed of this state of affairs, in many instances intimated his intention to disregard his contract and refuse to deliver his raisins to the packer who was thus slaughtering prices, the Executive Committee of this association felt that the association was strong enough to say to the packers: "This competition among yourselves in the Eastern market, at the expense of the grower, must now and forever cease, and we are strong enough, as an association, to stop your slaughtering of prices. Those of you who refuse to come into the association we are able to render powerless for evil by refusing to give you our raisins to handle."

On the 17th of August last about two hundred of the growers of the State, members of the association, assembled in general meeting in Fresno. At this meeting the Executive Committee reported that eighteen out of the twenty-two of the principal packers and coöperative raisin packing companies of the State had agreed to stop this competition among themselves. This meeting was addressed by Mr. Williams, of the firm of Williams, Brown & Co., and Mr. Lemcke, of the firm of Schact, Lemcke & Steiner, and the result was embodied in the following resolutions:

WHEREAS, One thousand one hundred and thirty-five growers of raisin grapes, representing 41,796½ acres of bearing vines, have signed the growers' agreement and joined this State Raisin Growers' Association, and are pledged upon the honor of each to stand together to protect the mutual interests of all growers; and whereas, we, the California State Raisin Growers' Association, in general meeting assembled, representing over 95 per cent of the raisin acreage of the State, have listened to the remarks before the convention by Mr. Williams, of Williams, Brown & Co., who also claimed to represent the firm of Cook & Langley, and the remarks of Mr. Lemcke, of the firm of Schact, Lemcke & Steiner; therefore, be it

Resolved, That in our opinion the manner of conducting the raisin business as expounded by the above-named packers is prejudicial to the best interests of the raisin growers, and tends to reduce the price of raisins; further

Resolved, That as long as these firms remain outside of the packers' organization, and refuse to sign the agreement of the other packers of the State, to maintain minimum prices, that we, the California State Raisin Growers' Association, further bind ourselves neither to sell them our raisins or do business with them in any way; and be it further

Resolved, That we express our thorough disapprobation and contempt of those firms who are operating in a way that will bring ruin to the raisin industry of the State.

As a result of such resolutions and the action of the association, nearly all the packers and coöperative raisin packing companies of the State fell into line, and agreed to observe the following prices, which prices are calculated upon a basis that will pay the grower 4½ cents per pound in the sweat-box for all good raisins, both of the first and second crop:

Clusters, 20 pounds.....	\$2 00 per box.
3-Crown London layers.....	\$1 65 per box.
2-Crown London layers.....	\$1 45 per box.
3-Crown fancy loose, faced.....	\$1 45 per box.
3-Crown fancy loose, unfaced.....	\$1 40 per box.
3-Crown loose, boxed.....	\$1 25 per box.
4-Crown loose, sacked.....	5½ cents per pound.
3-Crown loose, sacked.....	5 cents per pound.
2-Crown loose, sacked.....	4 cents per pound.
Seedless Muscats.....	5 cents per pound.
Seedless Muscats, fancy.....	5½ cents per pound.

The above are the minimum prices.

The only dissenting packers, whose pack could in any way affect the market, were Cook & Langley, Schact, Lemcke & Steiner, and Williams, Brown & Co. Messrs. Williams, Brown & Co., though refusing to sign, wrote to the association that it was their intention honestly to observe combination prices until further notice. The packers and the merchants, both here and in the East, are now reporting that they expect the raisin pack of this season, if properly handled, to bring a higher price than ever before known in the State, owing to the fact that the short crop of fruit in the East has so increased the price of dried fruit that raisins will, to a great extent, be used as a substitute.

As proof of the improved market which has been called into existence by the packer and grower agreeing upon one uniform price, many of the packers state that they have sold at the combination price all the first crop of raisins controlled by them. The Executive Committee of this association feel that this encouraging state of affairs is due entirely to the action taken by the association, backed by the firm attitude taken by 95 per cent of the growers of the State, members of the association refusing in any way to sell, or to do business with those packers who decline to sign the agreement to keep up prices.

THE WALNUT.

The walnut has been growing in favor the past few years, especially in the southern portion of the State, where sections are found in which soil and climate seem especially adapted to its growth. There are now 15,120 acres devoted to walnut growth in the State, of which 6,728 are in bearing and 8,392 not bearing. The principal walnut sections of the State are found around Rivera, in Los Angeles County, and in Ventura County. The trees there do phenomenally well, bear at a comparatively early age, and yield very large returns. The Los Nietos and Ranchito Walnut Growers' Association, whose members are all growers of the Rivera section, has been for several years the principal shipper of the walnut crop.

The crop of 1890, handled by this association, representing the product of forty-seven growers, amounted to 761,019 pounds (6,536 sacks), for which was received \$59,611 84.

The crop of 1891 (fifty-one growers) was 702,469 pounds (6,619 sacks), and brought \$58,020 83.

In addition to the above, growers not members of the association raised and shipped walnuts in amount and value equal to about 25 per cent of the association's shipments.

This year upwards of ninety growers have joined the association, and with the big harvest and increased acreage of young groves coming into

bearing, the yield and receipts for the crop of 1892 are largely in excess of previous years.

In October of the present year a special train of twenty cars, loaded with English walnuts, with an average of 20,000 pounds to the car, a total of 400,000 pounds, was taken by the Atchison, Topeka, and Santa Fe Railroad. The value of this freight is about \$2,000 a car, and the tariff for transit to market will be about \$400 a car. The nuts were bought of the Los Nietos Walnut Association by the Germain Fruit Company, to be sent to various Eastern cities.

C. A. Coffman, of Rivera, a prominent walnut grower, and authority on the cultivation of that nut, gives the following rules for the propagation and cultivation of the walnut:

"The first matter to be considered is the soil. I think a deep alluvial deposit, with little or no alkali, is best adapted. It requires good drainage, any subsoil which is impervious to water being objectionable; water standing around tree roots is hurtful, causing sour sap, and in time killing the tree; it is especially so if impregnated with alkali or mineral salts. I consider a depth of less than 10 feet to water objectionable; from 12 to 14 feet is better.

"I do not think the fogs a detriment to walnut growing, as our finest nuts are grown near the coast, where fogs are of frequent occurrence.

"In planting, trees should be put at least 50 feet apart, and I think 55 or even 60 feet is better. I have seen trees planted 40 feet apart, and after they had attained about twenty years, the branches overlapped to such an extent as to injure the fruitfulness of the tree, and it became necessary to remove some of them.

"I think soft-shells might be planted 30 by 50 feet, and when about sixteen years old remove each alternate one, thus leaving the trees 50 by 60 feet apart. The soft-shell commences bearing at five years of age, and from that time until sixteen years of age a tree ought to produce a total of 1,000 pounds of nuts. Or the trees could be taken out at twelve years and transplanted to good advantage. As I have said, the soft-shell commences bearing at five years; at ten years they are at full bearing, that is, the tree is fruited to its utmost capacity. Of course the tree keeps on growing for a number of years, and the larger the tree the more walnuts it will produce. I consider this by far the best variety, as the tree is thrifty, a good grower and bearer, fruit superior, and commands a better price in market than the hard-shell. The leaves also drop later; so that it makes gathering the crop more convenient, as the nuts are allowed to fall and then picked from the ground.

"This year we sold soft-shells at 8½ cents, hard-shells at 7½, and paper-shells at 9 cents per pound.

"The paper-shell trees are dwarfs, and the nuts small and hard to hull. I think, however, they might be made profitable by planting them by themselves and putting more to the acre.

"In gathering the crop the nuts should not be allowed to remain too long on the ground after falling, as the fog and sun are injurious to them, causing the shell to burst open, turning the nut black, and exposure to the sun causes the nuts to become oily and rancid.

"I think they should be gathered at least three times during the month or six weeks that they are falling. At the last gathering the tree should be shaken by means of a pole with crotch and hook.

"The hard-shell is not nearly so susceptible to the action of sun and

fog as is the soft-shell. In our section we have never been troubled with the hull sticking on the soft-shell, nor on the hard-shell to any extent. Perhaps one half of one per cent are unsalable on account of hulls sticking. In curing we use shallow trays, about 4 by 6 feet and 6 inches deep. These trays hold about one sack of nuts (110 pounds), have lath bottoms and handles at each end, which are taken by two men and thoroughly shaken; this allows the fiber and dirt to escape. They are then put through the grader. This has a sieve with inch meshes, and all nuts which are small enough to pass through this sieve are second-grade, and sell in the market for 2 cents per pound less than first-grade. Hard-shells from old trees give 5 or 6 per cent of second-grade nuts. The soft-shell trees are younger, as we have only recently commenced planting them. So far the second-grade soft-shells will not exceed one half of one per cent. Soft-shells should be cured in the shade, by spreading on a floor or in trays; they should not be spread over a foot in depth, should have an airy place, and will cure in a few days, especially if they have been allowed to fall from the trees. Hard-shells can be cured in the sun, as they will not open when exposed to its influence, as does the soft-shell; but I question the propriety of curing any kind in the sun, as I think it starts the oil in the nuts, causing them to taste rancid.

"In pruning, I think 4 or 5 feet from the ground high enough. It has been the custom to prune as high as 6 or 7 feet, in order to cultivate the ground underneath. I consider it detrimental to the tree, from the fact that it causes it to lean, thus exposing the south side of the tree to the sun and causing it to become sunburned. In pruning grown trees I should not trim the south side at all unless the branches interfered with each other; it is well to trim on the north side in order to balance up the tree, as they always lean toward the north. Nursery trees might be pruned to good advantage by cutting the tops off, thus preventing them from growing so tall and bending over.

"In cultivating the young trees it might be well to plow an ordinary depth of 4 to 5 inches, but with the older trees the roots should be allowed to come to the surface; a cultivator or even a sweep might be used.

"Land which requires fertilizing I should not consider good for walnuts at all."

THE ALMOND.

Much attention is being directed to almond culture in the State, and 10,333 acres are devoted to the growth of this nut. Of this amount 4,260 acres are in bearing, and the remainder, 6,073 acres, consists of young orchards.

That there is yet ample room for our almond growers in the home market, is proved by the fact that for the fiscal year ending with June 30, 1891, there were imported into the United States 6,812,061 pounds of almonds, valued at \$931,007, and this was increased the following year to 7,629,392 pounds, valued at \$1,028,671. Here are a million dollars now annually sent abroad that should go into the pockets of the California orchardists. The California output of almonds in 1889 was 22½ carloads; this decreased in 1890 to 10 carloads, the decrease being due to late rains which, coming at the time the trees were in bloom, prevented perfect pollination of the blossom. In 1891 the output reached

the normal condition, and with the new orchards which came into bearing that season reached 25 carloads.

For the present season the yield has been up to the average, and a large number of new orchards have come into bearing for the first time this season; and while at the present time there are no means of arriving at the exact quantity of the crop, it will probably be largely in excess of that of last season.

Prices for almonds vary but little, and are now quoted as follows:

Soft-shells	12½ to 13 cents.
Paper-shells	14 to 15 cents.
Hard-shells	5½ to 6½ cents.

OTHER NUTS.

Among nut-producing trees of the State the chestnut ranks next to the walnut; but while considerable attention has been paid to its culture, and some extensive areas are devoted to its growth, it has not yet assumed any great commercial importance. The tree does well over the greater portion of the State. It is adapted to heavy, clayey soils, and in California grows rapidly. The chestnut is principally grown in most of the southern counties, although it is found to some extent in nearly all the fruit counties of the State.

Pecans, filberts, and black walnuts are cultivated to some extent, and give good returns, but cut no figure in a commercial sense. Peanuts are also cultivated in considerable quantities, especially around Tustin, in Orange County, where their growth has become an important branch of horticulture.

Of native nuts, the hazelnut and pine nuts are foremost, the product of the latter forming no mean figure in the natural productions of the State.

SMALL FRUITS.

The crop of berries and currants this season was fully up to the average, prices were good, and the demand increasing. Considerable new land has been set, especially to blackberries and raspberries, which do well in most parts of the State, while currants and gooseberries are confined to limited areas, the hot weather of the interior not agreeing with their requirements.

A floating item to the effect that the wild Honey strawberry of the Sierra was being domesticated, drew from S. L. Watkins, of Grizzly Flat, the following statement concerning this fruit:

"I am glad to learn that the Honey strawberry, a species of *Fragaria chilensis*, is being extensively tested. From what I can see and learn of them they are a very superior berry.

"Last season I first became acquainted with the Honey strawberry, and when I first saw them I was greatly surprised at their immense productiveness. The Honey strawberry is oblong in shape, and in color a beautiful, glowing red. They are exceedingly sweet, juicy, aromatic, and delicious, melting in the mouth, without a particle of hard core. The berries are not what might be termed large, but by greater cultivation the berries can be made to average three fourths of an inch in length. This season I noticed Honey strawberries that were an inch and a half in length and half an inch in diameter at the base. I have

counted sixty-five ripe berries on a single plant at one time, and found numerous young shoots loaded with blossoms, and all sizes of young berries. This plant was no exception, as surrounding plants equaled it. In addition, these Honey strawberries are ever-bearing, and yield their greatest crop of fruit during July, August, and September, after all other varieties are gone.

"The Honey strawberry somewhat resembles the red Alpine of Switzerland, which is extensively cultivated there.

"I have learned of the following different varieties of foreign Alpines: The red and white Alpines, the berries are oblong in shape, splendid bearers, small, very sweet, juicy, aromatic, and delicious; succeed well with very trifling care. The red and white Wood strawberry is the wild strawberry of Europe, and is one of the easiest of cultivation; berries are round, very sweet, and delicate of flavor, and one of the most desirable kinds. The red bush Alpine and white bush Alpine are remarkable for their total destitution of runners, and are propagated by dividing the roots. This variety of Alpines is valuable for border plants, small gardens, etc. They grow in close, compact bunches; berries are conical in shape, quality excellent, and are very abundant bearers. Green strawberries are closely allied to the red and white Wood strawberries, and are remarkable for their rich, pineapple flavor.

"To sum up, the Alpine and Wood strawberries are noted for their bearing qualities, coloring, delicious sweetness, and hardiness. As their main fruiting season comes after most common varieties are gone, it is a good point in their favor. Even if the berries are small, they bear so abundantly and the quality is so superior that they make up that way for size."

DRIED FRUITS.

The demand and prices for dried fruit this season have been greater than since 1890, and very good prices have been received by our driers for their product. The unnaturally high prices of 1890, when bleached unpeeled peaches advanced in one week from 13 to 22 cents per pound, and dealers were frantic in their efforts to purchase, brought about a natural reaction in 1891, when prices fell so low as to leave no profit for the drier. This was caused by the fact that the Eastern jobber moved cautiously and purchased lightly. This condition did not last long, however, for the stock of dried fruit in the market was soon exhausted, and prices gradually advanced, and the early spring of 1892 found a depleted market. Prices started comparatively low early in the season, but as it was discovered that there was no stock on hand, they rapidly advanced until dried apricots and peaches, which form the staple articles of our dried fruit products, were quoted as follows:

Good apricots.....	12½ to 13½ cents.
Extra apricots.....	13 to 14 cents.
Fancy apricots.....	15 to 17 cents.
Unpeeled peaches, good.....	12½ to 13 cents.
Unpeeled peaches, fancy.....	13 to 14 cents.

Efforts were made during the season to force the market for the new crop of dried fruits to lower prices, but they were not successful, and the demand unquestionably warranted the high prices. The returns from the greater part of the Eastern States indicate a short fruit crop there, and renders it certain that California will have to supply the

bulk of the dried fruit output. The dried fruit crop will average about 65 per cent of that of 1891, but the quality is much better than that of last year.

The short fruit crop abroad, particularly of pears in France and tree fruit in Great Britain, will create a large demand on this country for canned and dried fruit, and as the crop of canning fruit, and also of apples and other fruit for drying, is short, the East will not be able to meet its own wants, let alone supply any of the requirements from foreign countries, and consequently California fruit will have to be taken. To show the foreign demand, we will state that for the fiscal year ending June 30, 1892, there were exported by the United States, of dried apples, 26,042,063 pounds, and green or ripe apples, 938,743 pounds. There were also exported, of canned fruit, \$1,558,825, and other green, ripe, or dried fruit, \$131,682. These statistics show that European and other foreign countries draw heavily from us, even when the crop abroad is an average; and with a shortage abroad, what would they take, provided it could be had?

One of the heaviest handlers and shippers of dried fruit, in speaking of the future of this industry, says:

"There is not, neither will there be, a glut in the dried fruit market. During the past year there has been so much territory opened to our fruits that the entire supply will be exhausted much earlier than it was last season. Prices range high now, and will be much higher in a month or two.

"The dried fruit business, like that of the green fruit, is yet in its infancy here. Every year we discovered so much about the needs of the trade, and improved methods in evaporating and drying, that twelve months hence we will conclude we knew nothing about the business. We are feeling our way, as it were, and learning our customers. We discover that the very same grade of a certain fruit has a slow sale in bags, when in 10 and 25-pound boxes it goes quite readily. In another part of the country we find the very reverse true. Merchants often write to us and ask to have their fruit packed in white cotton bags; others in boxes of various weight. Still another class of merchants prefer to have their fruit shipped to them in bulk, and they themselves grade and pack it as they think will best meet the approval of their trade.

"There is much more in this than most people suppose. What the fruit grower should aim at is quality, and a first-class article having been secured, there will be little trouble about price. The packing, while of great importance, is secondary to this, and undoubtedly the time is not far distant when growers will either not pack at all, or do so at the order and under the direction of the buyer.

"For the English market it is well known that boxes of about 25 pounds are preferred, and they must be packed with the finest paper and attractive lithographs. A box of fruit packed plain, without decoration, will not sell there at all. That in bags could not be given away. Apricots, pears, and now even raisins will sell well if half of the expense of the package is put in the box and fancy papers.

"The orchardist who plants drying fruit has a sure thing. Green fruit may find its market limited when all of California's broad acres are covered with fruit trees, but dried fruit never. It can be sent to

the remotest parts of the world, and the increased supply will only increase the demand.

"The industry has a bright future, and many farmers are showing their good judgment by investing liberally in drying fruits. The dried peaches, prunes, pears, apricots, nectarines, apples, raisins, and plums shipped from Sacramento daily amount to many thousands of pounds.

"The raisin market is somewhat dull, but our goods will all go at fair prices. The movement of raisins from this State so far this season is only about 50 per cent of the amount shipped to same date last year. Trading is very light and mostly with points west of the Missouri River. It is reported that many early orders have been canceled and some shipments rejected.

"The Fresno combination is still firm in holding for schedule prices, however. From the 21st of September to the 13th of October, 485,500 boxes (28 pounds per box net weight) of Valencia raisins passed Gibraltar, Spain, for New York."

REPORTS OF SPECIAL AGENTS.

CONDITION OF HORTICULTURE IN THE COUNTIES.

REPORTS OF SPECIAL AGENTS—CONDITION OF HORTICULTURE IN THE COUNTIES.

REPORT OF JOHN ISAAC, SPECIAL AGENT.

To the Secretary:

SIR: In accordance with your instructions I have visited the counties of Tehama, Shasta, Trinity, Siskiyou, Modoc, Lassen, Plumas, El Dorado, Amador, Calaveras, Tuolumne, Stanislaus, San Joaquin, Tulare, Merced, Alpine, Mono, and Inyo, for the purpose of investigating the condition of the fruit industry in each of them, together with their adaptability to the growth of various fruits.

In all sections visited I found a growing interest in horticulture. This has been stimulated by the prevailing low prices of wheat, which have left the wheat farmer small profit, and in many cases absolute loss, for his expenditure of money and labor, and he is gradually turning his attention to the more profitable industry of fruit growing. Another thing that has greatly aided the spread of the fruit industry is found in the fact that small holdings in fruit pay good returns, while wheat must be grown on a large scale to return any profit to the grower. Men of small means can secure a fruit farm of 10 to 50 acres, and derive an income from it, whereas, for farming purposes, a much greater area would be required, necessitating the outlay of large capital for plant, incurring large expenditure for working, and leaving small remuneration for the outlay and risk.

The superiority of most parts of this State for fruit growing has been recognized for many years past, and the great profit derived from this pursuit, where it has been intelligently followed, has been known, but it is of comparatively recent date that any great impetus has been given to it. In the great Sacramento and San Joaquin Valleys wheat was the staple crop. The land was held in large tracts, water was not available for irrigation, and it was not known where fruit could be grown without irrigation. But experiments have been made. In many localities it has been discovered that fruit trees will grow, thrive, and bear on apparently dry lands. In others, irrigation districts and irrigation companies have been formed and land put under water, many large ranches have been cut up into small farms, and these would not pay their owners so well in any other crop as fruit. All these causes have combined to force horticulture to the front among the industries of California, until to-day it holds the foremost place in point of importance, value of output, capital invested, and numerical strength of people engaged therein.

Fruit growing is rapidly assuming a position among the sciences. In the localities visited by me—and I believe the same is true over the whole State—the fruit grower is a student. He no longer plants his trees as it happens, and trusts to Providence for return, but takes into careful consideration the peculiarities of his soil, altitude, and climatic conditions, and considers all these in their bearings upon varieties. His

information upon the subject of economic entomology is broad, and he makes a careful study of the habits and weak points of his insect enemies, in order that he may profitably combat them. In all I have found that the fruit growers of the State comprise the best informed and most intelligent body of our citizens.

In *Tehama County* I found a very considerable area of new land being set to fruit, especially in the vicinity of Berendos, Vina, Tehama, and Manton, in which sections over 1,000 acres of new orchards have been set out during the past year. Peaches, apricots, and prunes are the favorite fruits, and comprise about four fifths of the trees planted, the rich alluvial soil of the river bottoms and the bench lands seeming especially well adapted to their growth. These fruits attain a state of perfection here not surpassed elsewhere in the State, yield abundantly, bear early, and have been found a very profitable crop.

To handle Tehama's fruit crop a canning and packing company was organized this year, with a capital of \$25,000, which is now in operation, employing sixty people. Its output for the first season will be from 10,000 to 15,000 cases, principally of peaches and pears, with some grapes.

Outside of the Vina district there is little irrigation. The orchardists on Deer and Antelope Creeks take water in private ditches direct from the creeks as they require it.

The fruit trees in this county are remarkably free from insect pests. The growers have fought them upon their first appearance, and have kept them well down, until the present cost of fighting them is a bagatelle, and the damage they do is little.

One of the great drawbacks of Tehama County, and the one that stands in the way of her taking front rank in point of importance among the horticultural counties of the State, lies in the fact that the greater part of her best land is still held in enormous tracts by individuals who are not prepared to subdivide them and put them on the market at reasonable figures.

In *Shasta County* I found a growing interest in horticultural matters. A few energetic men have acted as pioneers of the industry here, and with such marked success that others are rapidly following in their footsteps. A number of colonies have been established, which have met with greater or less success, but wherever fruit growing has been pursued with energy and intelligence in this county it has been profitable. Fruit of all standard varieties can be grown here. In the lower valley, around Anderson and Cottonwood, pears, peaches, apricots, and other deciduous fruits attain perfection, the trees are remarkably thrifty in their growth, and comparatively free from insect scourges and disease. In the higher foothill and mountain regions, apples of rare size, flavor, and keeping qualities are produced. Citrus fruits also appear to do well, and at Redding I found a number of orange trees from six to twelve years old, heavily laden with young fruit, and which exhibited no appearance of scale or other pests. At Anderson the favorite fruit appears to be the prune, to which fruit some very large orchards have been planted. Great attention has been paid to their cultivation, and they make an excellent appearance and give bright promise of good profits to their owners. Cottonwood has some extensive almond orch-

ards, and this nut does as well here as in any part of the State. Some extensive young olive orchards are being grown at Happy Valley, and on Dry Creek large quantities of peaches are produced.

Some of the oldest orchards in the State are found in Shasta County. In the early days, during the mining excitement in this and Trinity County, there was a large demand for fruit at the grower's own price; to meet this several men started orchards as early as 1852, and at the Tower House, on the Weaverville road, an orchard was planted in that year with trees imported across the Isthmus from the Eastern States. The first peaches grown in Shasta County were sold at the mines for \$1 each. Some of the original apple trees planted at the Tower House are still in full bearing, while at the same place is a grove of the largest and oldest English walnut trees in Northern California. Shasta is intersected by the main line of the Oregon Division of the Southern Pacific Railroad, and finds a ready market for her fruit products in Oregon, Washington, and Montana. As instancing the superiority of some of Shasta's fruit, while ordinary dried peaches sold last season at 6 cents, some extra fine fruit, grown and packed in Happy Valley, brought 16 cents in the Chicago market.

The outlook for the present season's crop here is above the average of the rest of the State; peaches were a good average crop, apricots were about 75 per cent loss, prunes and pears about 10 per cent below average, and all other fruits a full crop.

The soil of Shasta is largely a red loam, with a heavy admixture of gravel, and the valley is covered with a scattering growth of scrub timber. The county is well watered, being intersected by the Sacramento River, and into which a number of important streams find their way from the mountains. Prominent among these are Clear Creek on the west side, and the three branches of Cow Creek on the east. In the higher mountain regions Pitt, Fall, and McCloud Rivers are important tributaries to the Sacramento in this county.

There are large valleys in the interior of Shasta—at Fall River, Swasey, and other points—susceptible of cultivation to fruit, with abundance of water for irrigation. Apples, plums, and the more hardy varieties grow to perfection where cultivated, but their distance from railroads, and the difficulty and cost of transportation over a long mountain road, render fruit growing in these sections unprofitable, and all that is grown is a small amount for family and local consumption.

In *Trinity County* I found a large number of family orchards, largely apples, but with the decadence of the mining industry even these have been neglected, and very little attention is paid to fruit growing. Trinity is not a fruit county. There is a great deal of land suitable for orchard purposes around Lewiston, on the Trinity River, at Hay Fork, North Fork, Weaverville, and Douglas City, but very little of it is utilized for that purpose. The reason for this is found in the distance of these points from railroad centers and the difficulty of reaching market. From Redding, the nearest railroad station, to Weaverville is a distance of 47 miles, over heavy mountain grades. Between the two points are two toll roads and a toll bridge, the rates of which, owing to the small amount of travel, are very high; as a result freight rates are dear, and with the damage that would necessarily occur to tender fruit in a long wagon journey, renders fruit growing as a business in Trinity County

impracticable. Should she ever get easy and cheap transportation, however, Trinity will make her mark among the counties of the State as an apple section.

Some of the orchards here were planted early in the fifties, in the palmy days of her mining prosperity, and these, in spite of neglect and ill treatment, are still bearing. The McGillvary orchard, at present owned by J. H. Lawrence, situated on the Trinity River, 14 miles west from Weaverville, was planted in 1854, with trees imported from the States via the Isthmus. A second orchard of assorted fruits was planted by Mr. Dungee, at Weaverville, in 1855, and Jabez Chadbourne, now a resident of Alameda, planted an orchard in 1857. The largest orchard in Trinity County at the present time is about 20 acres in extent, and is the property of William Loudon; it is largely composed of apples, although there is a variety of other fruits.

The county is well watered by numerous streams which take their rise in the mountains and connect with the Trinity River, which flows northwesterly to a connection with the Klamath. Irrigation is very little resorted to, and only in a small way by farmers living along the streams. The valley soil is a detritus, or wash, from the mountains, and under proper cultivation would yield good returns in fruits adapted to it.

Siskiyou County ranks as one of the best apple counties of the State, more attention being paid to this fruit than to all others combined. The apples of Siskiyou are well known for their superior qualities, and in the San Francisco market always command the highest price. Little, however, is done in fruit growing as a business. Nearly every home grows a few trees for the purpose of supplying the family table with fruit, but orchards growing fruit for profit are not numerous. Those that do exist, however, have come into existence during the past five years, or since the completion of the railroad through the county. Before this time no notice was taken of fruit; a few trees supplied the family, and the surplus, if any, was fed to the hogs. The completion of the railroad, and the opening of a market thereby, have had the effect of turning attention to fruit growing as a business, and people owning suitable land within reach of railroad are gradually awakening to its importance as a profitable employment. The matter of transportation is still a troublesome one, as the best fruit lands of Siskiyou County lie remote from the railroad; the roads leading to them are rough, crude, and ill kept, and the fruit is damaged by its long haul in wagons over rough roads, which is more detrimental to the grower even than the increased cost of transportation to market.

The principal fruit sections of Siskiyou are Scott Valley, Big and Little Shasta Valleys, and Cottonwood Valley, and the banks of the Klamath River along its entire length. Of these, Scott Valley takes the lead. The nearest railroad point is 30 miles distant, yet considerable fruit finds its way from here to market. In 1891 over 200 tons of fruit were exported from this section, and the export of 1890 exceeded this. Apples form the bulk of the fruit shipment; in fact, it may be said to compose all, for while some peaches, plums, and pears are also shipped, these fruits are insignificant in quantity compared with the output of apples. The greater part of these shipments are sent to San Francisco, and the demand for Scott Valley apples has caused the plant-

ing of considerable new areas in fruit. This season alone over 5,000 trees were set out in this district.

Along the Klamath River is a belt of particularly fine fruit land. The soil is an alluvial deposit, black, and exceedingly fertile. The temperature here is much more equable than in other portions of the county, and in many places citrus fruit can be grown. The staple fruit, however, as elsewhere in the county, is apples. All other varieties of deciduous fruits flourish, and berries grow to perfection. Last season this section shipped 4,000 boxes of apples, chiefly to San Francisco and Sacramento, although some were sent to Colorado, and a small shipment even to Europe. There have been over 100 acres of new land set to fruit in this district the present season.

The present season's crop is not so large as usual. The late spring frost which extended over the whole State did not miss Siskiyou, but caught it when the trees were in full bloom; as a natural consequence, a very large percentage of the blossoms were killed. The crop, however, will average over 50 per cent, and the fruit is much finer, owing to the natural thinning by the frost.

Siskiyou is favorably situated in regard to markets. On the main line of the Oregon Division of the S. P. R. R., she is in close communication with San Francisco, Oregon, Washington, Montana, and the East. She possesses good soil and abundant water for irrigation. With her more important sections opened by good wagon roads or small railways, there is no reason why she should not hold a foremost place among the fruit-growing counties of California. That her people are beginning to awaken to the importance of this branch of industry is evidenced by the fact that more new orchards and a greater acreage of fruit have been set out this season than in any other one year in its history.

Modoc County is very unfavorably situated for fruit growing. The nearest railroad point to Alturas, its county seat, is 153 miles distant, and as a result fruit cannot be exported. What is grown here is used wholly for local consumption, and the surplus, if any, serves as hog feed. Many kinds of fruit do well, however, in Modoc, apples especially, to which the soil, altitude, and latitude of this county seem well adapted. Besides apples, some plums, pears, cherries, and apricots, with a few peaches, are grown. These fruits are found principally in the Goose Lake district, where there are about 150 acres in fruit; Surprise Valley, which has 100 acres; Hot Springs Valley, having about 20 acres, and Big Valley, about 10 acres.

The whole country here is of volcanic origin. The rocks are lava and obsidian, and the soil largely a volcanic ash, with occasionally some sandy loam and adobe. The county has numerous natural meadows, and the principal industries are wool growing and stock raising. It is well watered, a number of important lakes being found within its borders, prominent among which are Rhett, or Tule Lake, Goose Lake, Clear Lake, Upper, Middle, and Lower Lakes. A very large number of streams of more or less importance either take their rise in or flow through Modoc County.

Some attention has been paid to irrigation, chiefly for agricultural purposes, but no organized effort to use the water of the county for this purpose has so far been made. What irrigation has been done has been confined to the work of individual farmers who have diverted the water

of streams flowing through their property. In July of the present year the first incorporated company for irrigating the lands of Big Valley was organized. This was incorporated under the name of the Bull Run Irrigating Company, with R. A. Ricketts as President, and S. H. Paulk as Secretary.

In Surprise Valley, Big Valley, Hot Springs Valley, and many other portions of Modoc County, I found vast bodies of land suitable for growing many kinds of fruit to perfection, but which necessarily lie idle for lack of transportation facilities.

Lassen is another county in the apple belt, and here I found an increased and growing interest being taken in horticulture. This is largely due to the possession of railroad facilities, which enable her growers to market their products in reasonable time, good condition, and at fair prices. A large part of the apples grown here have found a market in Los Angeles, where their superior qualities have created a good market for them. Northern and northeastern California are preëminently the apple region of the State, and the fruit grown in these counties cannot be surpassed in any qualities by the Eastern fruit. Those who claim that while California excels in all other fruits, but cannot grow good apples, have never visited these sections nor seen the fruit to which they are so well adapted. Apple growing gives promise of becoming an important industry of Lassen County, and it is imperative that some measures be taken to prevent the introduction and spread of pests. While not very bad, I found that the woolly aphis, the codlin moth, and minor pests have obtained a foothold, and no united effort is being made to overcome them. Several of the larger orchardists are spraying with preparations prescribed by the State Board of Horticulture, with good effect, but their efforts are threatened with nullification by the indifference of their neighbors, who do not appreciate the ravages which these pests are capable of when they once get a firm foothold, or the enormous cost of fighting them when once thoroughly entrenched. It would be well for the Supervisors of Lassen, and indeed of every county that has not already done so, to appoint a Board of Horticultural Commissioners and local inspectors, and the fruit growers of these unprotected counties should take the matter in their own hands before it is too late. The law, which is mandatory, gives them the power in the following words:

Whenever a petition is presented to the Board of Supervisors of any county, and signed by twenty-five or more persons who are resident freeholders and possessors of an orchard, or both, stating that certain or all orchards or nurseries, or trees of any variety, are infested with scale insects of any kind, injurious to fruit, fruit trees, and vines, codlin moth, or other insects that are destructive to trees, and praying that a commission be appointed by them, whose duty it shall be to supervise their destruction, as herein provided, the Board of Supervisors shall, within twenty days thereafter, select three Commissioners for the county, to be known as a County Board of Horticultural Commissioners.

The principal fruit sections of Lassen County are Milford, on the west shore of Honey Lake, where there are 150 acres in fruit; Susanville, 70 acres; Janesville, 35 acres; Long Valley, 20 acres, and Big Valley, 12 acres. There are a number of small places through the mountains where some fruit is grown, which will aggregate about 50 acres more, making in all 337 acres, by far the greater part in apples. Other fruits, however, will do well, and berries wherever tried yield largely.

In common with most other parts of the State the fruit growers of Lassen report a short crop the present season. The apple crop will not reach much over half that of the average year, but prices are ruling higher, which somewhat compensates the grower for his shortage.

Several large irrigating schemes are on foot here looking to the reclamation of the lands of Honey Lake Valley and the Madeline Plains. There are very large areas of fertile land in both these sections, and with irrigation these could be made exceedingly productive. Water for irrigation can be procured from Eagle Lake, Susan River, and numerous small streams fed by the winter snows, while good sites for reservoirs are numerous. With water on her sagebrush lands, which are very fertile under cultivation, Lassen County will take front rank in the production of her favorite fruit.

In *Plumas County* I found no interest being taken in fruit at all. Around most of the dwellings are a few trees, but these are neglected, overrun with weeds, and allowed to grow as they will. This condition of affairs is largely due to lack of transportation facilities and the consequent absence of demand for fruit products. A number of very large and fertile valleys, which are well watered, exist in this county. These are used for pasturage and dairy purposes. The principal fruit grown is the apple, and wherever any attention is paid to it it does well. At Shoo Fly I found a small orchard of mixed fruits, owned by Robert Martin, and consisting of apples, pears, peaches, prunes, and cherries, in which the trees gave evidence of care and evidently repaid their care. Sufficient was here shown to prove that with proper care and cultivation fruit growing could be made successful in Plumas County.

The principal sections in which fruit is grown in Plumas County are American Valley and Indian Valley. On the Feather River, at Rich Bar, there is a warm belt in which a great variety of fruit is grown on a small scale, but as there is no outlet for it fruit growing is not followed for profit. No new orchards are planted, and the old ones are neglected. The first trees in Plumas County were planted as early as 1856, by John Taylor, in Indian Valley. These were apples. Judge Ward followed with a small apple orchard, and in the palmy mining days of Plumas every home had its little orchard. Fruit growing for profit, however, has never been followed here, and the industry was merely incidental, mining being first pursued, and this being followed by stock raising and dairying.

The higher portion of Plumas has an elevation of 3,000 to 4,000 feet above the sea, and a series of grassy and well-watered but treeless valleys stretch across its length. These are connected with each other by cañons, passes, or low divides. The more prominent of these are Big Meadows, comprising some 30,000 acres, Mountain Meadows, Butte Valley, Indian Valley, Genesee Valley, and Clover Valley. All these are very fertile and capable of producing the more hardy fruits in abundance, but their sole use at present is for dairy purposes.

A very large variety of wild fruits is found in the mountains of Plumas County, among them strawberries, raspberries, blackberries, thimbleberries, serviceberries, gooseberries, and hazelnuts, and from the vigor of their growth and luxuriance of their product it is evident that Plumas is the home of the berry; and if the time ever comes that this county is connected with the outer world by rail and a demand for

these fruits is made, berry culture will become an important industry of Plumas County.

Her remoteness from market, the long and difficult mountain roads which it is necessary to traverse in order to reach her fertile valleys, and the great cost of transportation consequent thereon, militate against the prosperity of Plumas County and keep her in a backward condition in relation to other counties of the State more favored by circumstances and often less so by nature. During my visit here several engineering parties were in the field seeking a suitable route through the county for a railroad, which it is projected to build. Speaking of this and the change that the building of this road would effect, the Oroville "Register" says:

"The effect of a railroad through Plumas would be like touching the gas jet on the dark and somber stage, when all becomes light and life and animation. It would be like the whistle in a great mining camp after a period of idleness; there would be movement and activity, the sound of the sledge, ax, and hammer on every side. It would be like the effect of daylight upon the masses of a great city when every man springs at once to active work of some character.

"Plumas has a thousand undeveloped and latent sources of wealth. These would spring into quick and surprising activity with a railroad to foster them. Mills would be erected to devour her magnificent forests, mills would be built to crush and stamp her gold-bearing ores. Her rich and fertile valleys would become of great value for agricultural purposes. Her dairymen would wax fat from the sale of thousands of rolls of golden butter. Her towns would awake, new and handsome residences would be erected, and there would be energy and improvement upon every side. Better than all these would be the flocking to the magnificent valleys of thousands of summer visitors who would enrich the residents of that county. This stream of visitors would never cease as long as there were grand forests to drive through, dark, deep, and crystal lakes to sail over, clear, bright streams to fish in, towering mountains to ascend, beautiful valleys to visit, and health-giving springs to resort to."

El Dorado County is rapidly changing from a mining to a fruit-growing county, and I found great interest taken in horticulture here. Coloma, the spot where gold was first discovered by James Marshall, an event which made the State of California possible, changed the tide in the affairs of tens of thousands of families, and even modified the destiny of our nation, is the principal fruit section of El Dorado County. The change is marked, and Coloma has accepted the new order of things. Her first great source of prosperity—gold—being exhausted, she turned to the next and more permanent source of wealth, horticulture. Over one half the fruit of El Dorado County is produced in this district. One of the first orchards planted in California after American occupation was set out here by Peter Weimer, a partner of James Marshall, who grew some trees from seeds procured from imported dried apples, and in 1848 set out the first apple orchard in the newly discovered gold fields of El Dorado County. This orchard has now passed out of existence, but around the spot where it stood is grown some of the finest fruit of the State.

Following Coloma in order of importance are Diamond Springs, Placer-

ville, El Dorado, Granite Hill, and Georgetown. A very large range of varieties is grown here, peaches predominating, and forming over half the total. Pears, prunes, cherries, apples, and plums follow in order. Some apricots are grown at Granite Hill and Coloma, but they are not a favorite fruit. A number of olive trees are growing in the county, and do very well. Along the western border of the county is a stretch of land on which the citrus fruits do well, and oranges grow here as thriftily as in any part of the State. Berries do equally well with the larger fruits. In fact, El Dorado County in its various portions has soil, climate, and conditions suited to almost the entire range of horticultural products.

I found here a very efficient County Board of Horticultural Commissioners, consisting of C. W. Albright, E. W. Meglone, and J. H. Thomas, to whose efforts the comparative freedom of El Dorado County from fruit pests is largely due. In some of the mining portions of the county, where the importance of their efforts are not appreciated nor the destructiveness of the orchard pests understood, they have met with some opposition, but in the more important fruit sections their efforts have been cheerfully seconded by the growers, and as a result the pests are decreasing in most sections of the county.

The crop outlook in El Dorado County, as elsewhere this season, is poor, although it averages better than in most localities. Peaches returned about three fourths of an average crop, pears and apples two thirds, plums half, and prunes not over a fourth of a crop. Good prices paid for fruit this season and the heavy demand for it have given a stimulus to the industry, and a very large area of new land will be set to fruit during the coming planting season.

The topographical features of El Dorado are its rolling hills, increasing in height until the mountains are reached. It ranks among the foothill counties of the State, and its prevailing soil is the red loam characteristic of the foothills of the whole Sierra Nevada range. These in their varying altitudes furnish conditions favorable to a wide range of fruit, from the citrus family of sub-tropical regions, which flourish on the lower lands, to the apple and more hardy fruits of the north temperate zone, which attain perfection in the higher levels. At Placerville I measured a walnut tree, planted by A. Eideinger in 1858, and still owned by him, which had a spread of limbs 70 feet across, with a trunk 7 feet 10 inches in circumference 6 feet from the ground, where two limbs branch out each with a circumference of 4 feet 5 inches. This is the largest walnut tree in El Dorado County, and one of the largest in the State.

With the decadence of mining in El Dorado the old mining ditches have gradually, like the land itself, changed their occupation from mining to horticulture, and while much of the water is still used for mining, a very large part of the old mining ditches are now used for irrigating purposes.

At Placerville two packing houses were in active operation at the time of my visit, one a branch of the Cook & Langley Company, the other of Barnett Bros., of Chicago. Both houses were working night and day to handle the fruit brought in to them. Barnett Bros.' branch here was established last season, and shipped 40 cars of green fruit from Placerville for the first year's business. Cook & Langley opened their branch this season. While the season was not far enough advanced to form an

estimate of the amount of fruit that would be shipped by them this year, enough was known to justify the statement that it would very much more than double the figures of last season.

Amador is another mining county in the foothills. Over the greater part of it fruit is not grown for profit, although there are many little orchards in all the principal sections of the county. Nearly every house has a few trees for supplying the home with fruit, but it is only in the past few years that any attention has been paid to this industry for commercial purposes. Since the completion of the *Amador* branch of the Southern Pacific to *Lone*, in the western end of the county, however, an impetus has been given to fruit growing, and the *Lone* district is making its mark as an important horticultural district of the State. A number of very excellent orchards, well kept and thrifty, are found here. The favorite fruits are prunes, peaches, apples, pears, apricots, and almonds. In *Jackson Valley* there are several hundred acres of rich bottom land suitable for fruit growing, but the older orchards have been neglected and most of them have been allowed to die out.

Plymouth is a mining town in its decadence. There are a number of fruit trees here, and apples would do well if cared for; but nothing is done for them and they are rapidly dying out. *Dry Town* has some better-kept orchards, and at *Amador* I found a number of small family orchards, principally apples, but none of them of importance. At *Sutter Creek* there are two quartz mills in active operation, and the town itself presents a more thrifty appearance than those first mentioned. The orchards are small and better kept, but fruit growing is merely incidental, and what little is done in this line depends wholly upon the prosperity of the mining industry.

Jackson, the county seat, while largely dependent for its prosperity upon the mines of the county, is more of a fruit section, and a number of orchards, ranging from 1 to 80 acres, are found on *Jackson Creek* and tributary to the town. The greater part of the fruit raised here is grown by Italians, who devote their attention more to vine growing than to the culture of orchard fruits; but large quantities of peaches, apples, pears, and plums are produced. The larger part of these are used in local consumption, although a considerable amount, especially of apples, finds its way out of the county, being shipped to *Stockton* and thence to the Eastern States and *San Francisco*.

Fig trees seem to do especially well in this vicinity, although no effort is made to grow this fruit for market. A large number of fig trees are scattered over the county, all of the *Mission* variety, and the trees are remarkable for their size and their heavy yield of fruit. No use is made of the crop, and the larger part is allowed to rot on the ground. One of the largest fig trees in the State is growing on the *Pardoe* place, near *Pomegranate*, which has a spread of nearly 100 feet across. It is exceeded in size by but one tree of its kind that I have found, and this is growing on the *Wildermuth* place, between *Campo Seco* and *Valley Springs*, in *Calaveras County*.

The olive tree does equally well with the fig in the vicinity, and the *Genocchio Bros.*, of *Jackson*, have a few trees, that by their remarkable size, thrifty growth, and extraordinary yield of fruit, prove what could be done with this fruit were proper attention given to it. The soil and climate of the foothill sections seem especially adapted to the growth of

figs and olives, but so far these fruits have not attained any importance, and little use is made of those grown.

The *Genocchio Bros.* have a very excellent *Alden* drier at *Jackson*, which was built by them in 1877 at a cost of \$8,000. Last season they turned out 36,000 pounds of dried fruits, mostly prunes. This season the drier is idle, the shortage of the fruit crop and the prevailing high prices not warranting its operation.

The effects of the last season and the frost which came at blooming time have been felt in *Amador* as elsewhere, and the peach crop here is nearly a failure, plums and prunes are about half a crop, while apples and pears are average.

No efforts are made here, except individual, to prevent the introduction and spread of pests; and while the damage done by them so far is not extensive, they are a threatening danger to the fruit grower. *Amador* gives promise in many parts of growing importance as a horticultural county, and some efforts should be taken to prevent the danger that threatens the orchards before that danger becomes too powerful to overcome.

Leaving *Jackson* I next visited *Calaveras County*, stopping at *Mokelumne Hill*, a very attractive and well-watered section, in which are a number of small orchards and several vineyards of considerable size. Some of the oldest trees in the county are growing here on the land of *Frederick Mayer*. The towns of *Calaveras County*, like those of the adjoining counties, owe their existence to the mining discoveries of the early days of the State. Many of the miners, after locating their claims and their cabins, planted a few trees around their homes for their own use, and these became the pioneer orchards of the county. Mr. Mayer's orchard is one of these, and it has been in existence from the later forties, and has become surrounded with numerous others. The orchards here, while not extensive, are better kept than those of most mining towns, and the trees look thrifty and well. The chief fruits are apples, pears, peaches, prunes, with some walnuts and almonds. The nearest railroad outlet is at *Valley Springs*, 12 miles distant, to which point fruit is shipped by teams.

In the neighborhood of *West Point* some excellent apples are grown, and large quantities of these find their way into the *Stockton* and *San Francisco* markets. Eighty-five tons of apples were shipped from *West Point* last season, and sold at 2½ to 3 cents per pound at *Stockton*. A considerable quantity of fruit here is dried. This is dried by individuals, there being no drying nor packing firms.

The crop output this season averages in *Calaveras County* about the same as in other sections. Peaches are almost a failure, not over a fifth of a crop; apples, pears, and apricots about one half, and prunes somewhat better, about two thirds.

This county seems well adapted to the growth of the olive, a fact which is being recognized by some enterprising orchardists. At *Jenny Lind* H. H. Moore, of *Stockton*, has 160 acres in olives, and *Matthew Gregory* 40 acres. These trees were planted three years ago, and have made a very thrifty growth, and give promise of bringing in a good income for their owners in a few years.

Other fruit sections of importance in *Calaveras* are *Murphys*, which, at an elevation of 2,300 feet, produces some very fine apples; *Robin-*

son's Ferry, Angels, Burson, and San Andreas. The orchards here are nearly all small, ranging from 1 to 5 acres.

The lack of better transportation facilities in the interior prevents the profitable growing of fruit in Calaveras, but enough is done to show that this county is well adapted to a wide range of horticultural products, and that in the growth of many of the more hardy fruits she can excel the valley counties.

Calaveras boasts the largest walnut tree in the State. This is growing at Chile Gulch, while at Campo Seco is the oldest orange tree in Northern California. This is over thirty years old, and measures 11 inches in diameter.

Tuolumne County does not rank as one of the fruit-growing counties of the State. It is essentially a mining county, and while there are several orchards of importance here, in the majority of cases they have a neglected appearance. Many of the old orchards have gone to decay, and but few new ones are planted. This is due largely to poor water facilities and lack of transportation conveniences; Oakdale, the terminus of the Stockton and Copperopolis Railroad, in Stanislaus County, being the nearest shipping point to Sonora, the county seat. A great deal of complaint is made about the lack of water for irrigating purposes. The water is controlled by the Tuolumne County Water and Ditch Company, which derives its water from the headwaters of the south fork of the Stanislaus River. This system was originally constructed for mining purposes only, and but little attention has been paid to the requirements of the irrigationist. The canals are neglected to a great extent, and in the summer months, when water is most needed for irrigation, there is frequently a shortage. In consequence of these drawbacks very little fruit is produced in Tuolumne County.

A wide range of fruits can be grown here, including apples, pears, peaches, plums, nectarines, apricots, figs, walnuts, almonds, persimmons, cherries, and oranges. The chief market is local, very little is shipped, and that exported is dried. Some of the choicer apples are barreled and find their way to San Francisco, where they sold last year at 2 to 3 cents per pound.

One of the leading orchards of Tuolumne County is that of the Macomber Bros., at Sonora. This comprises 15 acres, mostly apples, and is well cared for. A large portion of its product is manufactured into cider and vinegar by the owners, who also purchase fruit from other growers. They have quite an extensive establishment, and manufacture a very superior article of both cider and vinegar, finding a market in Stockton and San Francisco for their wares. The Macomber Bros. rank among the pioneer orchardists of Tuolumne County, if not of the State, having planted their orchard in 1852, importing trees from Oregon for that purpose at a cost of \$2 50 each.

The principal fruit sections of the county are Sonora, Columbia, Tuttle town, and Jamestown. Near Tuttle town, at the Adobe House, I measured a Mission vine that was 125 feet in length.

The soil is generally red foothill and black loam, with very little sand, and usually very fertile. The great difference in elevation in various portions of the county gives opportunity for a very wide range of orchard products, and nearly every species of fruit and berry grown in California can be produced in some portion of Tuolumne County.

The land and the climate are here, but lack of proper irrigating and transportation facilities have worked against her, and kept her in the rear ranks of the fruit counties of the State.

The fig does remarkably well here, and trees, left to grow wild, are found in many parts of the county. The largest fig tree in the State is probably one growing at J. A. Goodwin's place at Chinese Camp. This has a trunk 12 feet in circumference, and produces exceedingly large crops. Some fine Japanese persimmon trees are also growing here. Near Jamestown, John Mooney has also some very large fig trees. No care is taken of them, and they are allowed to grow according to nature. In the more inaccessible portions of the county many old orchards have been dug out and their sites planted in hay.

Stanislaus' chief industry is wheat growing, and from the earliest period of California's history she has held front rank in this pursuit. Although there are many small orchards which have been in existence for a number of years, fruit growing has not been a feature of the business of Stanislaus. Of late years, however, more attention has been turned to this industry, and the county now boasts a number of large orchards, and produces some excellent fruit.

One of the most favored fruit sections of the county is at Knights Ferry, on the Stanislaus River. Here I found some remarkably large fig trees, and in the orchard of Kaspar Vogt some of the oldest orange trees planted north of Los Angeles. The trees are very large, showing a thrifty growth, and produce as fine fruit as is grown in the State. Oranges from this orchard were marketed in Modesto as early as 1874. Lemons and limes also do well, and for olive growing the soil and location cannot be surpassed. Knights Ferry is an old mining camp, located in the foothills on the eastern edge of Stanislaus County, of no great elevation, not exceeding 600 feet, and protected from winds and frosts. The soil is a rich black loam, reaching to the summit of the rolling hills, and well fitted for orchard purposes.

At Oakdale, the present terminus of the Stockton and Copperopolis Railway, there has been a strong impetus given to fruit culture in the past few years, and this section gives promise of becoming the chief fruit-producing portion of Stanislaus County. The Stuart Bros. have nearly 400 acres in growing fruit, a large part of which is now bearing, and comprising apricots, peaches, almonds, prunes, pears, and apples. Their orchards are well kept, and their trees look thrifty. In connection with their orchard they have a canning establishment, and pack their own fruit, or so much of it as they do not dispose of in a green state.

There are a number of very fine orchards about Modesto, and a great deal of new land is being set to trees in this vicinity. A large number of orange trees are being planted, and those now growing here look as well and make as thrifty a growth as any I have seen in the State. Near Modesto, on the Tuolumne River, is the Paradise orchard, owned by Mrs. Stephen Rogers, one of the largest orchards in the county. It covers 110 acres, and is now twelve years old. This orchard is planted in the river bottom on made land, deep and rich. It requires no irrigation, and the trees yield very heavy crops.

It has been urged by the older settlers of Stanislaus that nothing but wheat could be grown on the dry lands of that county. Starting upon the theory that trees, if properly cultivated and attended to, would grow with no other moisture than that supplied by the winter rains,

Mr. J. B. Coldwell planted an extensive orchard of various fruits—peaches, olives, apricots, figs, and oranges—near Modesto, and the result has justified his theory. He has a large number of bearing trees on his place which have never received a drop of irrigating water.

On the west side of the county there is a large area of excellent fruit land, but little effort has been made in the line of orchard work here as yet.

Stanislaus ships a large amount of fruit, her markets being in San Francisco and the East, and the larger part being shipped green, in boxes. There is a shortage in the present season's yield of all classes of fruit, but the yield of nuts, both walnuts and almonds, of which there is a large amount grown, is more than average.

Like all the new fruit counties, Stanislaus has not awakened to the importance of preventing the introduction of orchard pests, or of the necessity of taking measures to that end. The Supervisors have appointed no Horticultural Commissioners, and the fruit growers spray or leave the pests to spread, as it suits them. It would be well if all counties that have not done so should take protective measures, for even in those counties of least horticultural importance there is a considerable quantity of fruit grown, and this industry is already the most prominent of the State, and a continually growing one, and one indifferent or neglected county may be the means of infecting all. For its own sake and for its neighbors, therefore, every county should take measures to keep out the orchard pests.

Several big irrigation enterprises are now under way in Stanislaus, among others, two districts organized under the Wright law—the Turlock District, covering 176,210 acres, and the Modesto District, with 80,564 acres. The San Joaquin and Kings River Canal, owned by Miller & Lux, flows for 75 miles in the county, and supplies water for a large section. As these are all described more fully elsewhere, I will dismiss them here.

San Joaquin County, while its chief output is wheat, is rapidly assuming a front place among the fruit counties of the State, and a number of very large orchards are found within her boundaries. The chief fruit lands of the county are found along the Mokelumne and Calaveras Rivers, at Lodi, Stockton, and the numerous islands formed by the sloughs and forks of the San Joaquin River. In the Lodi and Acampo district, especially, fruit growing has made rapid strides in the past few years, and a number of very large orchards are found here. The largest of these is the Hatch-Armstrong ranch at Acampo, consisting of 1,015 acres, and having 68,000 trees of various kinds, almonds predominating, and 18,000 vines. There are a number of other very extensive orchards here, among them A. Van Guelder's, of 320 acres; Strong & Williamson's, 320 acres; Buck & Corey, 400 acres; B. F. Langford, 140 acres; L. Mowrey, 320 acres; Dr. E. F. Grant, 100 acres, and a large number of others, ranging from 5 to 100 acres in extent.

The cost of planting an orchard of 40 acres at Lodi, as given by a practical orchardist, is interesting to those who desire to invest in this branch of industry, and I give the same herewith. The estimate is made by Mr. Frank J. Lease, and is a complete statement of the cost of planting his 40 acres of trees, and the caring for the same for the present year, ending February 1, 1893. In making his statements Mr. Lease

referred to his receipted bills and account books. Nothing was guessed at, bunched and "averaged in," hence these figures can be relied upon as being the correct result of practical experience. Following is the statement:

2,616 almond trees (best varieties)	\$368 75
200 assorted trees for personal use	69 72
Plowing 40 acres	80 00
Marking and staking	10 00
Digging holes	12 50
Planting	25 00
Freight and drayage	5 00
Miscellaneous labor	15 00
Contract with man to take care of place one year, to February 1, 1893	200 00

Total cost of orchard when one year old (not including taxes and interest)..... \$785 97

On the islands and along the river bottoms, which consist of a deep vegetable mold, very large quantities of berries of all kinds are grown. This fruit is large and fine flavored, and the yield is very large. From these points San Francisco receives a large percentage of her blackberries, raspberries, strawberries, and other small fruits. For her larger fruits, San Joaquin finds a market in San Francisco and the East, her shipments last year being over 650 tons of green fruit alone, and this will be largely increased by the present season's exports.

The growing demand for the fruits of San Joaquin County and the profits derived from the orchard industry are gradually changing this county from a cereal to a fruit section. Nearly all the orchards are young, and few are yet in full bearing, and every year sees their number increased. This season it is estimated that over 2,000 acres have been added to the fruit area of the county, chiefly in small tracts of from 10 to 60 acres.

The excellent transportation facilities enjoyed by San Joaquin County, having both water and rail communication from most of the interior points with the outer world, give her a great advantage over the greater part of the counties in the State.

A very conscientious Board of Horticultural Commissioners work for the interests of this industry here. These are W. H. Robinson, J. Hale, and J. M. Benson. Under their supervision the orchards are kept clean, and such pests as exist are gradually being overcome.

Several large nurseries flourish here, and large quantities of trees are exported to other counties. Over \$250,000 are invested in the nursery business, and stock of all kinds and of every variety is kept.

The county is well supplied with water, several large rivers intersecting it, each of which receives numerous tributary streams. Besides these, a large number of artesian wells are in operation around Stockton, from which large streams of water flow, sufficient to irrigate a very extensive area of fruit land.

Tulare County is preëminently a fruit county, and while there are numerous other important industries, fruit growing takes the lead. For many years, Tulare was the leading wheat and stock county of the State, and while both wheat growing and stock raising are still important pursuits, fruit growing has in the past few years made such rapid strides as to cast them both in the background. Tulare is located largely in the San Joaquin Valley, the eastern portion reaching the Sierra Nevada Mountains. Nearly the whole valley portion, with the exception of alkali patches, which are found occasionally, is adapted to

fruit and vines, and a very large portion of the land so adapted is already planted to fruit. Even in the mountain sections there is good apple land, and numerous orchards are found, while the foothill region is filled with nooks and valleys adapted to fruits of all classes, both citrus and deciduous.

At Traver and Kingsburg I found a number of thrifty young orchards and a very considerable area of new land in fruit. Traver lies on the line of railroad, and like much of the land along the railroad in Tulare County, is heavily impregnated with alkali. A short distance from the road on either side, however, the character of the soil changes, and some very thrifty vineyards and orchards are found. At Dinuba, on the east-side road, there are also evidences of marked improvement and an awakened interest in fruit growing. A very large number of young orchards are found tributary to the town, which is the center of a very important section. Some 6 miles from Dinuba toward the foothills is Orosi, one of the most fertile spots of a fertile county. The soil here is a rich deposit of sandy loam, or silt, made land of old waterways, which brought large deposits of wonderfully rich soil from the adjacent mountains and deposited it in the valley. This soil is of that peculiar, pervious nature which renders irrigation easy, the seepage from the canal keeping the soil continually and sufficiently damp to insure the most luxuriant growth of vegetation known.

In this district I found an almost phenomenal growth of tree and vine, the oldest orchards, which are not over five to seven years of age, equaling in size, vigor, and fruiting capacity those of twice or three times their age in most locations. The whole district is thickly set to orchard, and all varieties do equally well. Many young orange trees growing here prove from their thrifty appearance that Orosi is adapted to citrus as well as to deciduous growth.

The foothill region of Tulare County has been proved by actual experience to be especially adapted to citriculture. The elevation of the small valleys here, their position, surrounded by low rolling hills, protected from frost and winds and exposed to the full force of the sun, with, in most cases, ample water for irrigation, adapts them essentially to the growth of sub-tropical fruit. Oranges do well here, but lemons have taken a favorite place with the orchardists, and large areas have been planted to lemons this season, especially at Lime Kiln and in the Yokohl Valley. The young trees give promise of amply repaying the faith of their owners and the outlay of capital in their planting. I found on the Pogue ranch at Lime Kiln, quite an extensive lemon orchard of twelve-year old trees. These have been in bearing for several years and return a certain and remunerative crop. No frost has ever touched them.

At Porterville a very strong impetus has been given to orange growing, and a very large area of land has been set to this class of fruit in the past two years. This was accelerated by Porterville having taken the first prize for seedling oranges over all competitors at the last citrus fair at Los Angeles. The young trees show a remarkably thrifty growth and are absolutely free from insect pests. I visited, while here, the pioneer citrus orchard of this section, now owned by W. J. Prettyman, where I found several varieties of oranges, together with lemon and lime trees. These have been in continuous bearing for many years, and no touch of frost has ever been felt by them. This is essentially

the citrus belt of Tulare County, and, with its adjacent sections, Plano, Pleasant Valley, Daunt, and others, gives promise of adding very materially to the output of citrus fruit in California in the next few years. But it is not to citrus fruits alone that Porterville has been devoted, but in the past few years, with the liberal encouragement of the Pioneer Company, the whole region, which a few years since was devoted to wheat, has been converted into a vast orchard and vineyard, in which nearly every variety of fruit known in California can be found. In the town of Porterville are several large lemon trees, which it is claimed are the largest in the State, and which yield very heavily.

The favorite fruits at Visalia, the county seat, are the peach and the prune. Here these attain their perfection in size, flavor, and yield. One seven-year old prune tree in the Briggs orchard, adjoining the town, has a record of 1,102 pounds. It is claimed by prune growers here that the average yield of seven-year old trees is from 600 to 700 pounds.

The Visalia "Times," alluding to the yield of prunes in this locality, has the following:

"Last year our prune crop was not so large as it has been in previous years, but it was good enough to pay a profit of \$300 or \$400 per acre, even at the low price of fruit. This year the crop is simply immense. In the older orchards trees seven years old will average 700 pounds of fruit to the tree. It will be safe to make the statement that some of the trees will yield 1,000 and up to 1,200 pounds. At the present price of prunes, there are 900 trees on the Briggs orchard, situated near the city, that will yield the owner at least \$9,000. The orchard is under the supervision of M. J. Rouse, who was the manager in 1890, when one prune tree yielded 1,102 pounds.

"Thomas Jacob & Brother completed the task of gathering prunes from one acre of their four-year old trees growing on their ranch, 5 miles east of this city. From this acre of trees they obtained in round figures 26 tons of fruit, or 52,000 pounds. These prunes were sold in the early part of the season at 1½ cents per pound, fresh. The one acre thus realized \$910."

While I was in Visalia the crop of three prune trees in the Briggs orchard was gathered and weighed, with the following result: First tree, 662 pounds; from this 150 pounds had been previously gathered, making a total of 812 pounds. Second tree, 834 pounds, to which was added 150 pounds, the amount that had been taken off before, making a total of 984 pounds. The third tree gave 767 pounds, but 250 pounds were allowed for what had been taken off by Mr. Briggs and for the further reason that a large limb or two had been taken off, as the fruit had broken them down. The three trees show a total yield of 2,813 pounds. These were selected trees in a nine-year old orchard.

There has been a very large increase in the fruit acreage of Visalia in the past season, and some very extensive orchards have been planted.

In and about Visalia I found a great many orange trees, all of which gave evidence of a thrifty growth. These are grown for ornamental purposes and family use. On the Curtis ranch, however, about 5 miles from Visalia, there is an extensive orange orchard that has been in bearing for many years, and proves very profitable to its owner.

Tulare City is awakening to the value of the fruit industry. Ushered into existence as a railroad town, for years division headquarters,

her people relied upon the railroad as a prop to their prosperity, and when the machine shops and officers' quarters were removed a short time since, many of them fancied they were ruined and the town killed. But Tulare lies in the heart of a belt of magnificent fruit land, and for some years this industry has been growing up around her until it has become the main support of the town; as a result the removal of the railroad business has not done more than to cause a temporary depression of feeling, from which she is rapidly awakening to find that she possesses a basis of prosperity more solid by far than that which she has lost. All about Tulare there are large tracts of new land planted to orchard, peaches and prunes being the favorite fruits.

Tulare County is the county where fruit growing is carried on on a magnificent scale, and orchards and vineyards from 100 to 1,000 acres are not uncommon. Many of these are owned by companies, which, prosecuting the work on a large scale, can accomplish it at a minimum of cost. Near Tulare is the Paige & Morton fruit farm, which covers nearly 1,200 acres. This is one of the most extensive orchards in the State, and it is worked on exclusively business principles. From 300 to 500 people are employed, and every labor-saving appointment for cultivating, picking, and curing is adopted. Below is the output of green fruit from 700 acres of this ranch in 1890. The figures for 1891 and 1892 will not vary much from these, for, while the trees are older and many new ones have come into bearing, there has been a shortage, owing to late frosts, which cut off much of the blossoms:

Of green fruit picked and dried there were the following quantities:

	Pounds.
Apricots.....	339,411
Peaches.....	1,589,398
Nectarines.....	185,282
Pears.....	21,170
Plums.....	4,605
Prunes.....	22,283
Total.....	2,292,149
And this sold for \$60,113 58.	

In addition to this, green fruit was shipped as follows:

	Pounds.
Peaches.....	525,916
Nectarines.....	25,236
Pears.....	258,954
Plums.....	100
Total.....	810,206
Sold for \$24,252 03.	

Of grapes there were picked and dried 2,284,565 pounds. Out of these were made and sold 512,502 pounds of raisins. There were shipped green, besides, 37,296 pounds of grapes. And the whole product of the vineyard sold for \$28,709 75.

The product of this single ranch for 1890 was 5,423,139 pounds of fruit, which sold for \$113,075 36. The proprietors expect that when the entire plant shall have come into bearing it will produce 10,000,000 pounds of green fruit of one kind and another upon an average year after year, and the estimate is believed to be entirely within bounds.

Hanford, the metropolis of the Lucerne Valley, is also the center of a very large and exceedingly productive fruit section, including the districts of Armona, Grangeville, and Lemoore. The chief industry here

is raisin growing, and the country is especially adapted to this growth. Some of the finest raisins in the market are grown in the Lucerne Valley district, and there I found a very extensive area in vines. While the raisin industry stands at the head of horticultural pursuits in this district, other fruits are not neglected, and the prune and peach follow close upon the lead. Hanford claims for her district the largest single body of prune trees in the State—the Kimball orchard of 544 acres. This orchard is 6 miles northwest of Hanford, and was put out in the spring of 1891. There are 66,000 trees in the orchard, and probably 30,000 of these trees show a growth of 10 feet this year, and many a growth of from 11 to 12 feet, with a 12-inch girth of the trunks, the number of limbs on the trees varying from 10 to 40. With the exception of a few spots which were overflowed or were strongly impregnated with alkali, the trees have grown rapidly and evenly.

In the same vicinity is the Lucerne Vineyard, owned by Paige, Root & Monteagle, and covering 900 acres. During the picking season 450 people are employed in the vineyard. This was a year old last spring, and gave an average yield of 10 pounds of grapes to the vine the first season.

There has been a very large area of new land planted in the Lucerne district to both vines and trees this season, the acreage of trees very largely exceeding that of vines. It is estimated that the increase will amount to nearly 33 per cent.

As showing the cost of planting and caring for a vineyard to a paying age, the following statement has been furnished:

COST OF VINEYARD OF TEN ACRES.

Ten acres of land, at \$100 per acre.....	\$1,000 00	
6,750 Muscat cuttings, at \$5 per acre.....	50 00	
Plowing and harrowing, \$3 per acre.....	30 00	
Laying out the land and planting.....	100 00	
After-cultivation, at \$3 per acre.....	30 00	
Cost of the first year.....		\$1,210 00
Pruning, \$3 per acre.....	\$30 00	
Plowing and harrowing, 3 times.....	75 00	
Cost of second year.....		105 00
Pruning, \$5 per acre.....	\$50 00	
Cultivating, 3 times.....	75 00	
Cost of third year.....		125 00
Pruning, \$6 per acre.....	\$60 00	
Cultivating, 3 times.....	75 00	
Cost of fourth year.....		135 00
Pruning, \$8 per acre.....	\$80 00	
Cultivating, 3 times.....	75 00	
Cost of fifth year.....		155 00
Raisins produced in six years, at a cost of 30 cents per box.....	2,370 00	
Total expense.....		\$4,255 00

INCOME EACH YEAR.

Second year, 100 boxes, at \$1 50 per box.....	\$150 00
Third year, 800 boxes, at \$1 50 per box.....	1,200 00
Fourth year, 2,000 boxes, at \$1 50 per box.....	3,000 00
Fifth year, 2,400 boxes, at \$1 50 per box.....	3,600 00
Sixth year, 2,600 boxes, at \$1 50 per box.....	3,900 00
Cost of six years.....	\$11,850 00
Net profits for six years.....	4,255 00
	\$7,595 00

From this time on the vineyard will produce the full profit of the sixth year.

The orchardists of Tulare County generally are in a flourishing condition, and are fully alive to the importance of the fruit industry. A very efficient Board of Horticultural Commissioners exist here, and the county is districted between them, N. W. Motheral having the Lucerne Valley, C. P. Berry the Visalia, and R. H. McDonald the Porterville district. Their efforts in behalf of the fruit growers are enthusiastically seconded by the orchardists, and as a result the orchards of Tulare are remarkably healthy, and free from pests of all kinds.

Merced is another of the San Joaquin Valley counties that is rapidly changing from a cereal to a fruit-producing section. While it has not equaled in this respect its neighbors of the south, I found very large areas in new fruit and an active interest being taken in the industry. The fruit industry here is of comparatively recent origin, and owes its start to the completion of the Crocker-Huffman Canal and the efforts of that company to settle their lands. Several colonies have been located here, and these have turned their attention largely to fruit, and with excellent success. At the Rotterdam Colony, some 4 miles north of Merced City, and near the foothills of the Sierra Nevada, I found a large number of thrifty fruit farms, well kept and promising good returns to their owners. The varieties cover a wide range and include peaches, prunes, plums, pears, figs, olives, almonds, oranges, and vines, and all seemed to be doing equally well. The soil is a deep chocolate-colored loam, and is irrigated from the Yosemite Lake, the reservoir of the Crocker-Huffman Canal. Near the Rotterdam Colony, and in the same thermal foothill belt, is the Atwater orange grove, a small patch of no great extent, but sufficient to prove by actual experience that citrus fruit will grow and do well in Merced County. A large olive tree heavily laden gives proof of the adaptability of the soil here to olive growth. Mr. Atwater has a very large variety of fruits, with which he has experimented, and he has demonstrated that all will do well where proper attention is paid them.

One of the most noted places in Merced is the Buhach ranch, near Atwater. The specialty there is the cultivation of the pyrethrum, from the flower of which the well-known insect powder is made. Besides this, however, there is a very large extent of land planted in vines and fruits, and all have made a most vigorous growth and yield large returns. Sufficient has been done to prove that Merced is well adapted to fruit growth, and enough is doing here to give promise that in a few years she will take her stand with her sister counties in the front rank of fruit-producing sections of the State.

In *Alpine*, *Mono*, and *Inyo* Counties I found little in the line of horticulture worthy of comment. These counties are largely mountainous, remote from market, and to a great extent unfitted for orchard growth. In *Alpine* there are a few small family orchards of apples, pears, and the more hardy fruits; but these are neglected. This is a timber, mining, and grazing county, and the small amount of fruit produced is not sufficient for the home demand.

Mono, in many respects, resembles *Alpine*, but there is more fruit

grown in the former. At Coleville and Bishop Creek I found a few small orchards, but none of any extent or importance.

In *Inyo* more attention is paid to fruit growing. There is a considerable area of good agricultural land, irrigated from mountain streams, and the farmers generally have a small patch of fruit and vines around their homes. No attention is paid to fruit growing as a separate business. I found apples, pears, peaches, prunes, plums, apricots, nectarines, and grapes growing there, and with neglected conditions they seemed to be doing well. There is no outside market for *Inyo*'s fruit, and no incentive for the grower to produce more than his family can consume, or the immediate local requirements demand.

In conclusion, I desire to acknowledge the assistance given in my researches by the people of the different points visited. I have found everywhere a very deep interest taken in horticultural matters, a demand for fuller information in regard thereto, and a deep appreciation of the work done by this department. Fruit growing has gradually increased in importance for the past twenty years, until to-day it stands in the lead, and it promises to overshadow all other branches of industry in the near future. The enormous shipments of fruit from this State are given by Gen. N. P. Chipman, from the figures of the Southern Pacific Railroad Company, from which the following are taken:

SHIPMENTS BY RAIL IN 1891.

	Pounds.
Canned fruit.....	49,566,680
Dried fruit.....	65,995,220
Green, deciduous.....	98,680,100
Prunes.....	10,220,700
Raisins.....	44,954,850
Citrus fruits.....	88,194,560
Figs.....	50,000
Nuts.....	10,223,560
Total pounds by rail.....	367,885,670

SHIPMENTS BY SEA IN 1891.

	Pounds.
Canned fruit.....	15,223,440
Green, deciduous.....	2,417,840
Dried fruit.....	747,914
Raisins.....	603,520
Nuts.....	94,500
Total pounds by sea.....	19,087,214

Making a grand total of 386,972,884 pounds of fruit exported from our State. Add to this 12,088 cases of olive oil shipped by sea, and 11,114,029 gallons of wine and 799,612 gallons of brandy by rail, and the vast importance of the fruit industry to our State will be appreciated.

The value of the fruit shipments alone from California, not including the wine and brandy product, will foot up in round numbers the enormous sum of \$26,000,000. It is these facts which give the work of your department its great importance, and lead the people to pay so deep attention to anything pertaining to orchard work.

I have received great assistance from the county officers of the different counties visited, especially the Assessors, who have very willingly lent their time to furnish needed information. To the newspaper pub-

lishers I am also indebted for many courtesies, and also to the fruit growers whom I have met.

There is a great laxity in most counties of the State in the matter of collecting statistics. In some the Assessors perform the requirements of the law faithfully, in others their returns are mere guesswork, and in others no effort is made to gather the required information. While this is true to a large extent, I have found that the importance of the work is becoming more appreciated, and it has been better done this year than ever before, the returns being fuller and evidently more accurate. The additional labor imposed on the Assessors and their deputies to secure the desired information while in the field, is small in comparison to its importance in the business interests of their counties and the State at large.

It may be well to here draw the attention of the Supervisors to their duty in the matter, in the hope that they may be induced to take some action for the gathering of such accurate statistical information as is required by the different branches of the State government. The County Government Act (Statutes of 1883, p. 374) provides as follows:

The Board of Supervisors must require the Assessor to report to the State Board of Equalization, annually, a true statement of the agricultural and industrial pursuits and products of the county, with such other statistical information as they may, by ordinance, direct, and enforce obedience of the Assessor thereto by deducting such proportion of his compensation as Assessor as to them may seem appropriate, for a failure to comply with the order.

If the Supervisors will take the matter in hand as here required, the work can be much simplified, little, if any, additional work will be laid upon the Assessors, much valuable information can be furnished in regard to the business condition of the State, and each county will benefit by it.

REPORT OF H. A. BRAINARD, SPECIAL AGENT.

To the Secretary:

SIR: Complying with your request, I visited the counties of Placer, Nevada, Sierra, Sutter, Yuba, Butte, and Sacramento, carefully observing every point which seemed to bear upon the horticultural interests of the sections and the State. Though very much limited in time I personally inspected every important district and orchard within the territory. I believe I shall do the subject better justice if I take the several counties in detail, and in the order in which the journey was taken.

Placer County is very fortunate in having the Central Pacific Railroad located through its extreme length in its course over the Sierra Nevada Mountains, and in having within its borders the junction from which the Oregon branch of the road takes its northward course toward the shadows of Shasta and the great States of the Northwest. This fact makes it possible for the growers to pick their fruits in the cool of the morning, pack them in airy fruit houses, place them on board the cars an hour or two before sundown, and know that the next morning will find them rolling down the eastern slope of the Sierra Nevada on their way to Chicago, Boston, or Philadelphia, as may be their destination. This means at least twenty-four hours' advantage in time over any other fruit section of California, making it possible to use a ventilator car for the shorter journeys, and a shorter transit period for the refrigerator car.

From the southern border of the county to Rocklin much of the land is included within the limits of one of the great ranches that are everywhere obstacles to horticulture and progress. Near the latter place one notices the outcrop of granite rocks, and tall derrick-poles, with swinging arms, indicate the prominent industry. Just beyond this town begins the great fruit belt of Placer County, of which Loomis, at an elevation of 400 feet, Penryn, at 626 feet, Newcastle, at 956 feet, Auburn, at 1,360 feet, and Colfax, at 2,422 feet, are prominent stations and shipping points.

The soil at Loomis, Penryn, and Newcastle consists of finely pulverized and partially decomposed granite, very open and porous, and in most places quite deep. Irrigation is here a positive necessity to success. Water is provided in abundance by the South Yuba Water Company, which has consolidated, by purchase, two systems of mining ditches, and extended its canals along all the prominent ridges of the section, so that nearly every acre of the land can be watered. These canals have been extended to Loomis, and, I believe, farther south to Rocklin. Water is sold by the miner's inch, the inch expressing the size of the aperture, square measure, through which the water flows under a four-inch head. The water costs \$45 per inch, whether taken during the whole year or only during the five summer months. The soil is so porous that little is gained by winter irrigation. An inch of water carefully used will irrigate 5 acres of orchard, thus making the cost \$9 per acre each year. This seems a high tax, but the orchardists say it pays, and so don't complain. Most of the orchards are on quite steep hillsides, and are irrigated by conducting a small stream along each row of trees, and even when the land is quite level the ground is never flooded. By this system, and the excellent drainage, so little of the surface is wet that it is almost like sub-irrigation, and no cultivation is required between irrigations, as is the case with flooding, or broad and multiple ditches. The irrigations follow each other at intervals of about ten days, and during the swelling and ripening of the fruit the water is almost constantly applied.

I heard the growers speak highly of the benefit of fertilizers, and considerable stable manure is used, with some nitrate of soda and superphosphates. The fruit is carefully thinned, and that which remains grows to a large size and takes on a fine color.

The peach is the favorite fruit, and more than half the trees are in this fruit. Early cherries and apricots, early apples and plums, and Bartlett pears are also grown, with strawberries, raspberries, and blackberries for the trade a few hundred miles east, in the mountains. Some vegetables, such as cucumbers, summer squashes, melons, and tomatoes, are raised for such Eastern points as demand them.

Coöperative companies have been organized at Penryn, Newcastle, Auburn, and Colfax to ship the fruit of the members. Some of these receive fruit from outsiders on commission. The well-known houses of Porter Bros. Company and Earl Fruit Company have houses and agents in all the towns. Cool fruit houses have been erected, with shaded platforms, and the cars stand while loading under cool sheds built for the purpose. I saw no fruit packing going on at the stations, this being in all cases done before leaving the home fruit house, every grower having some expert hands for this purpose. Peaches, pears, and the larger and choicer plums are each wrapped in paper before placing

in the box; common plums are packed in baskets, of 5 pounds, with paper between each layer of fruit, and four baskets make what is called a half crate, a favorite package. Cherries are packed in 10-pound boxes without paper, and no paper is used in packing the 5-pound baskets of grapes, which go into half crates the same as plums.

The largest orchards at Loomis are those of E. L. Hawk, J. Files, J. H. Barton, E. W. Maslin, J. F. Hill, Geo. Ellery, J. Freud, and the California Raisin Ranch.

At Penryn is located the orchard of Fred. C. Miles, one of the Commissioners of Horticulture, where, in addition to an extensive nursery, he has planted some 15 acres of oranges and a large amount of deciduous trees. I noticed a few trees of an old planting yet remaining.

At Newcastle the Olive Grove orchard of Sherman Bros. is carried on with great skill, and careful experiments are being made to test the value of different fertilizers, a practice worthy of being universal.

The fig is attracting considerable attention in this section, and young trees, two or three years old, have made a remarkable growth. The White Adriatic and some kinds called Smyrna, whether correctly or not I cannot say, have been planted, and a few years will determine whether the industry will be a paying one or not. Aside from figs, no fruits are dried, none are sold to canneries, but every pound of every sort and kind is packed and shipped. Fruit that becomes too soft for long shipment is marked and sent by express to near-by markets. The fruit is so thinned that there is really no small fruit, and that which is imperfect from other causes is very small in quantity. Although the apricot is raised, it has proved over and over again not to be a good mountain fruit, and should be confined to valleys and low points.

Newcastle is the oldest and most prominent of these three lower shipping points, and more fruit goes from there than from any other station; but from the prospect of young orchards and increasing facilities at Penryn, I shall not be surprised at the latter station taking the lead within a very few years.

The belt lying between an elevation equal to Loomis Station and Newcastle lies within what is known as the thermal belt of the Sierra slope, and here oranges and even lemons grow in great perfection, being apparently visited by injurious frosts less frequently than are the orange orchards of Southern California. The spring and summer climate is here quite warm, ripening the fruit in December and January—from two to four weeks earlier than most of the southern districts. Some orchards of olives have been planted, but no oil of any amount as a commercial article has been made.

Much mining was done in this section in mining times, and the valley of every little stream shows signs of heavy washing, while here and there the dumps of old quartz mines are seen, and old dilapidated frames of stamping mills. One mine, a rather noted quartz ledge, was the Julian Mine, owned by the Schnabel Bros. Some five or six years ago they began to plant trees on their lands, and about three years ago sold their machinery, turning the property from the Julian Mine into the Julian Orchard, from which they are now shipping many carloads of finest fruit. I found there a late peach—the Levi Cling—highly spoken of by them as one of the best, and best selling of all the late sorts.

Between Newcastle and Auburn the soil changes from a granite soil

to a reddish, clay loam, with a slate outcrop instead of granite. Auburn is an old mining town, and it is said that the land on which the court-house stands would pay well for washing. About the older houses still stand some of the apple trees that were planted in the early days, and some have been removed to make room for improvements. With the change of soil comes a change of fruit. Below Newcastle the peach leads, but above that point the pear begins to take preference, and this region is in the great "Bartlett Pear Belt," so often spoken of. The increased elevation makes the ripening perceptibly later, and the trees and fruit have a very fine appearance. The peach loses what the pear gains. The Auburnian insists that if the peaches are somewhat less in size than the prize fruit at Newcastle, it is of much better flavor and more sought after in market. This assertion is borne out by the fact that the Colfax Mountain Fruit Company was offered \$1 a box for all their peaches, when the best Newcastle fruit was only bringing from 60 to 75 cents. The fruit certainly is excellent. Irrigation is here not so much needed as below, one application of water answering for from two to four weeks. An inch of water is sufficient to irrigate more than five acres. With good cultivation, and in localities where there is a deep soil, fruit can be grown fairly well without irrigation, but water is a great aid in making marketable fruit.

Between Auburn and the American River a tract of 70 acres has been laid out as a sort of horticultural park, and planted with citrus, olive, and deciduous fruit trees. The orange trees looked very healthy at the time of my visit, and were loaded with fruit. This tract is known as *Æolia*.

Near Auburn Mrs. Emily Roberson has a fine olive orchard, some portions of which have been long enough in bearing to enable her to manufacture oil for several seasons. She has the Redding Picholine, and her oil has secured so favorable a reputation that all she can raise is taken at once when ready for market. P. Clos, near by, has an olive orchard eight years old, from which he has made some oil, and is just ready for good crops. Mr. C. E. Evans has 50 acres of orchard near Colfax, which is doing finely without irrigation. He has developed some springs by digging, and secured water to irrigate 3 acres of small fruits and an acre or so of garden vegetables. W. B. Hayford has 40 acres in Bartlett pears, bearing this year for the first time, and the Cape Horn Vineyard has 40 acres of Tokay grapes. W. M. Baker, one of the County Horticultural Commissioners, has about 8,000 Bartlett pears, and 35 acres of table grapes. J. B. White has the pioneer vineyard, planted fifteen years ago, and Eddinger Bros. have 100 acres in fruit, 40 acres being grapes, and the remainder divided between peaches, pears, and small fruits. The Morrison grape ranch consists of 160 acres, mostly planted in table grapes. The orchard of William Henbly, and that of Myers & Henbly, are planted around the dumps of the old Rising Sun Mine, and the color of the Tokay grapes is now a matter of more consideration than the "color" of the old mining days.

Owing to a cold storm occurring the last of April fruit in all the upper portion of Placer County was, this year, almost a failure. Apples and pears escaped partially, but peaches and plums suffered severely. The early crop of figs was destroyed, but the second crop is full.

From the proportion of young orchards not yet in bearing, and the

fact that unplanted lands are not held at extremely high figures, thus giving encouragement to future planting, there can be no other conclusion but that Placer County will very soon stand in the front rank of the fruit-producing counties of the State.

Farther up the railroad toward the summit some small but fine apple orchards, with some pears, are found at Dutch Flat, Alta, and Shady Run, the latter place at an altitude of 4,160 feet, but higher than this it is too frosty to depend on fruit. In the old mining camps, such as Yankee Jim's, Forest Hill, Todds Valley, and Michigan Bluff there are old family orchards which supply home consumption, but to get the fruit out in good condition over a rough mountain road is impossible, and no further progress is likely to occur very soon.

Nevada County lies north of Placer, and as one alights from the overland train at Colfax the neat coaches of the Nevada County Narrow Gauge Railroad standing at one side suggests a way of reaching it. This Nevada railroad leaves Colfax parallel with the Central Pacific on its eastern side, but descends more rapidly than that road for several miles, and when the great overland line crosses the valley on its elevated bridge to begin its circling climb of Cape Horn Mountain, the little narrow gauge dodges under and soon crosses the Bear River into Nevada County. You Bet is one station, and Greenhorn Creek is the name of a stream up the bank of which the train travels for a few miles, then crosses over and comes directly back again on the western bank till enough of elevation has been obtained to enable it to swing off to the right and circle around into Chicago Park, a colony founded and mostly settled by Chicago people. Seen from Colfax hill this place seems like a quite level valley, but a nearer acquaintance proves the location to be composed of low rolling hills from which a heavy growth of timber has been cut. Like too many of the colonies of California, purchasers had ideas too visionary to be realized, and trusted the early planting and care of their lands to those who did not do it well. As fast as the purchasers have taken up their residence and given personal attention to their orchards, they have become prosperous, and are now beginning to bear fruit. About 400 acres of fruit and grapes have been planted, and most of the growers are members of the Colfax Mountain Fruit Company. No irrigation is practiced, but by extending the canals of the South Yuba Water Company for a few miles the whole colony could be reached with irrigation. Peaches and pears are favorite fruits.

Chas. Stafford, Eugene Sailer, Doctor Pushac, Chas. Wendt, C. H. Briot, A. McCorkell, John White, and Wm. Kipp are leading orchardists. The soil is the red loam of the mountains.

Grass Valley is still one of the most active of the quartz-mining districts of California. Horticulture is generally confined to small orchards of from 2 to 10 acres planted in early days, which have all along given a good supply of fruit, for which there has been an active home market, and a demand from mountain mining camps. Within a few years some new orchards have been planted and a fruit company formed. Fruit now finds an outlet at Colfax. There is much land about here finely adapted to the culture of small fruits, and the establishment of a cannery is very much desired. It would extend this branch of horticulture beyond the limits of a local demand to which it is at present

limited. Irrigation is generally practiced in all the larger orchards, water from the stamp mills and mines being used.

John Thomas, and John Rodda, W. C. Jones, F. R. Reed, J. W. Butler, Charles Parker, White & Co., and Louis Wheeler are owners of some of the larger orchards. O. L. Twichell has an old orchard and vineyard 2 miles from town, and Mr. W. Loutzenheizer is beginning to develop a fine orchard of pears, peaches, and prunes. S. L. Richards, the local Horticultural Commissioner, has a small orchard of 5 acres. He reports great difficulty in making the owners of the old orchards realize the necessity of careful spraying to keep them clean. Mr. J. F. Kidder, President of the railroad, has a wonderful family orchard opposite the depot, in which he raises everything grown in California. It is a grand index of horticultural possibilities.

Nevada City is also a mining town of considerable present activity, and its horticultural condition is practically the same as that of Grass Valley. With the cessation of hydraulic mining, the active local demand for fruit has ceased, and the horticultural industry is not active. The fine shipping fruit is sent East by way of Colfax. There is no trouble in raising good fruit here. The only question is one of market. Mr. W. H. Smith has planted 17 acres of prunes, and will plant as many more this year, and will dry them for market. As both Grass Valley and Nevada City are more than 2,000 feet above the sea, artificial heat may, in some cases, be needed to dry fruit, but it seems as if a good cannery and drying establishment would enliven the fruit industry materially, and give employment to many people.

Samuel Allison, near Nevada City, has an orchard in which he cultivates everything in the way of deciduous and small fruits. The apple, pear, white cherry, peach, Persian mulberry, and blackberry are favorites. Walnuts and almonds succeed well. The Persian mulberry gives a constant succession of fruit from July till October. It is not a shipping fruit. Felix Gillet has done a good work for the State in introducing French walnuts and filberts.

At North San Juan, near the northern boundary of the county, are many small family orchards. In the orchard of J. H. Wichman I found the largest peach trees I have seen in California. Jacob Wichman has planted about 6 acres of new orchard, and William Hughes has a thousand apple and peach trees. In San Juan are some fine French or Italian chestnut trees bearing large crops, showing that the mountain location exactly suits them. San Juan was a very prosperous mining town, but now fine brick buildings, with iron shutters and ornamental iron balconies, either stand empty or are used as Chinese joss-houses. At French Corral, at an elevation of from 1,300 to 1,400 feet, I found the first orange trees, seedlings planted thirty years ago, full of fruit. At Bridgeport, most of the original orchard planted in 1855 is still standing and bearing, and some new trees have been planted. The falling off of mining has taken away the demand for fruit. This place is on the river and only 700 feet above the sea. At Pleasant Valley, near Anthony House, are some old orchards, of apples and pears, and Mr. N. A. Hartung has about 5 acres planted in peaches, prunes, pears, and apples. Excelsior Water Company have about 30 acres of peaches, and Pet Hill Fruit Company have planted 100 oranges and quite a large orchard of deciduous fruits.

The fruit crop for 1892 has been very small, a few peaches raised at

Chicago Park and by the Excelsior Water Company being the total supply of this fruit for the whole county. This almost total destruction of fruit has never occurred before, I am informed.

Nevada County will never be a prominent fruit county unless some through line of railroad is constructed, or local industries established creating a home demand. The water in the mining ditches could be used to develop an immense amount of power now going to waste.

Sierra County has very little fruit. Entering the county by the stage road, a little distance east of Camptonville the road rises 1,000 feet in 3 or 4 miles, and gets above the elevation of possible fruit culture. Snow falls here in winter to the depth of 16 feet; snowshoes are required on the horses, and tall trees of sugar pine, fir, and cedar are the only products of the soil. In some of the small valleys on the right and left are small family orchards. At Mountain House, from an elevation of 4,500 feet, one looks down upon Goodyear Bar, 2,000 feet below, and 6 miles distant, where H. H. Kennedy has about 1,000 trees, noted as being the largest and best orchard in the county. All along up the valley of the Yuba, to Downieville, are small orchards from a dozen to a hundred trees, and in and about Downieville itself there may be an aggregate of 50 or 60 acres, all in small parcels. In the orchard of J. W. Brown, at Downieville, I picked fine Napoleon Bigarreau cherries, August 23d, the last of a crop of 500 pounds on a single tree. Beyond Downieville, in Sierra Valley, there is a fine agricultural section, where they raise the real old Eastern timothy, and red clover hay, and good crops of grain, with fine pasturage for cattle, but the frosts are both too late and too early for fruit. Mr. Brown showed me a chunk of gold about the size and shape of a Bartlett pear, from a near-by mine, valued at \$1,100, while a cupful of smaller nuggets were good for \$1,600. When the local demand for fruit is satisfied there is no use for more. Fruit wagons from the lower valleys bring them early fruits before their own are ripe.

Pure, cold water gushes from the rocks in little streams at almost every turn. When the winter snow has settled solid they fill a storehouse with it, cover it with straw, and when the sun beats down and reflects and re-reflects its heat till the thermometer goes up above the hundred mark, the bottles of soda water that nestle around a sack of preserved snow acquire a delicious coolness.

Yuba County.—A mountain corner of this county, near Camptonville, first claimed my attention. After a long, dry climb up the ridge from Tom Freeman's bridge I found the small orchards of W. J. Baden, John Chanler, and Chris. Barge, and at Junction House left the stage and plunged down a couple of thousand feet into Garden Valley, where I found the orchards of Augustus Cilly and John Clay, old residents, who planted their trees long ago. This location was on the old Marysville pack-trail, and there once was sale for all the fruit they could raise, at good prices. Mining is still conducted in this valley, but the demand for fruit is gone. About 5 acres each of apples and pears, with a few peaches, made up the list. Mr. Cilly had excellent blackberries. A few new trees have been planted within a few years. Good transportation or a good local demand would make these orchards profitable. They told me Tom Bird, at Bullards Bar, had an orchard, but I was unable to see it. On the hills above Garden Valley lies "Nottoway Orchard

and Vineyard," the property of the widow and heirs of John Ramm, deceased, over 100 acres, 30 or 40 of which are fruit, and the remainder table and wine grapes. The Tokay, Muscat, and Black Morocco grapes develop perfectly, and peaches, plums, apples, and pears usually give large crops. This orchard owns many wagons which go on regular trips through the mining region with fruits and wine. It has an established trade and makes money. J. D. Jayne, near Camptonville, has a good orchard. Chestnut trees yield 50 pounds to the tree. A small golden plum has such an excellent reputation among the hotelkeepers and housewives in the country round about that he cannot raise enough of them. The soil is very rich. I learn that the prize apples, pears, and grapes of Yuba County came from this corner of the county.

Entering the county again at Smartsville, I found here an old mining town, and from the gravel of an ancient river bed, just west of the main street, there are accounts of millions of gold. In most of the yards about the houses there are fine orange and fig trees. On the place of James O'Brien there are about 50, planted fifteen years ago, and he has 600 planted in another place. These are all thrifty and full of fruit. On the Bonanza ranch, owned by the Excelsior Water Company, there are 150 bearing orange trees and 20 lemon trees, planted about fifteen years ago as an experiment. All are full of fruit. Twelve hundred orange trees were planted last year, 1,000 figs, and 2,000 apricots, and preparations are made to plant 400 acres more. B. Stanford has a grand variety orchard of 60 acres. From near Smartsville to within 5 miles of Marysville there is a succession of large ranches, without a tree or anything more interesting than a stretch of stubble land, that looks none of the richest. Mr. O'Brien, of Smartsville, is constructing an irrigating canal to his large ranch, has planted an acre of oranges, and there is prospect of a change. Browns Valley, off to the right, has an irrigation district, under the Wright law, the bonds sold, and water flowing in the ditches. John Palmer raises several acres of small fruits, and great progress is looked for. The J. H. Boyer orchard of 30 acres of pears and peaches lies near the Yuba River. James S. Mills, Mrs. J. S. Mills, J. W. Mills, and Dr. Jewett have, in all, orchards amounting to 130 acres, of which about 10 acres are figs, apricots, peaches, and prunes making up most of the remainder. Joseph Phillips, who assisted General Sutter in planting the first trees in Sutter County, and his partner, Mr. Abbott, have large orchards, recently planted.

The celebrated Briggs orchard, planted on the Yuba River near here at a very early day, was bearing fruit in 1854 and 1855, but has been buried under the debris of the mines. E. W. Hutchins, on the Feather River above Marysville, has a large orchard of peaches, apricots, Bartlett pears, cherries, apples, and English walnuts. The city of Marysville has many hundred bearing orange trees standing on residence grounds, and the success of these has proved the region adapted to citrus trees. Many have been planted within a few years. On account of the filling of the river beds with slickens, high and strong levees are now required to protect Marysville from floods. Marysville is a terminal shipping point, has a good cannery, a branch of the Golden Gate Packing Company of San José, and Yuba County has every circumstance favoring its horticultural progress.

Sutter County has developed a remarkable adaptation to peach growing, and its fame in this direction is increasing every day. Its whole frontage on the Feather River, and to a great extent along the Sacramento, is protected by a strong system of levees. These levees are probably the most expensive in the State. The orchard section of the county is a belt lying along the Feather River, within the levee, from one to two miles wide. This land is rich, and requires no irrigation whatever. Not only do the trees grow finely, but the fruit attains a large size and a fine consistency and flavor. Prunes are attracting some attention, and there is now a yearly pack of from 70 to 100 tons. General Sutter planted some olive and orange cuttings in 1842, but they never grew; but in 1845 some cuttings of the Mission grape grew, and soon bore fruit. There was fruit bearing in 1855, as several persons recollect—apples, peaches, and pears.

Here are several large and important orchards. The Riviera orchard of Cutts & Hudson lies partly in Butte County, near Live Oak. The 206 acres already planted are half in peaches, with 30 acres of apricots, 20 acres of almonds, 14 acres of pears, with a quantity of prunes, figs, and apricots. Only a part of the orchard is in bearing, and 100 acres three years old gave 100 tons of fruit. Situated on the bank of the Feather River, the fruit was transported to Yuba City by barge, carrying about 600 boxes of fruit each load.

S. J. & H. P. Stabler have a fine orchard of a little over 100 acres—more than half peaches, with a good assortment of other fruits. B. G. Stabler has an orchard of the same size. R. C. Kells has two orchards, one of 83 and one of 100 acres, with a general assortment of fruits and grapes. I can recommend the fruit and packing house on Mr. Kells' orchard as the best I saw at any place. Both Mr. Kells and Mr. Stabler use steam for heating water for scalding prunes, preparing sprays, and other purposes. J. P. Onstott makes a specialty of the Thompson seedless grape and apples. He has a vineyard of about 100 acres. The Briggs orchard of over 300 acres; the Abbott orchard of 400 acres; the F. Hauss orchard of 100 acres, in which 70 acres of peaches, four and five years old, produced over 400 tons, the daily product being about 15 tons, and Mrs. Jeannie Starr's orchard of 45 acres, are among some of the more prominent orchards. At Marcuse, on the Knights Landing road, from 80 to 100 acres were planted by Mr. Marcuse and Mr. Tharsing, in the spring of 1881, and they were able to show first-class peaches at the Marysville fair, in September, 1882. On the Sacramento River, Elwood Varny has a young orchard of 100 acres, and N. Rideout, on the Knights Landing road, an orchard of 40 acres.

Yuba City has a cannery, the Sutter Canning and Packing Company, in which most of the Sutter County fruit growers are stockholders, and enjoys the same facilities as Marysville as a terminal point. More of the fruit accredited to Marysville in the railroad reports comes from Sutter County than any other point. Shipments are easily made to Oregon and Washington if there is a demand, Sutter and Butte Counties having the same advantages in this regard that Placer has in reference to the overland traffic. There is room for great development, and the world will soon hear from Sutter County.

Butte County, though well to the north, has a climate warmer than can be accounted for by its latitude. It must be accounted for by the

peculiar relations of its valleys and ranges of hills both east and west. The Feather River has a long course through the county, and from the point near Oroville where it emerges from the hills to the south limits of the county, the bottoms on both sides are rich fruit lands. The bottom lands on Butte Creek, Little Butte Creek, and Rock Creek are, to a certain extent, used as fruit lands. At Oroville Table Mountain rises with almost perpendicular walls to an elevation of 1,200 feet above the sea, and at the foot of this, on some rolling hills on the north-west bank of the river, is situated Thermalito, one of the great orange colonies of Northern California. Five miles south of Oroville, and reaching back from the railroad to the foothills on the east, is Palermo, another important orange colony. At Bidwells Bar, a dozen miles above Oroville, is a seedling orange tree, early planted, which has never failed of a crop except in a single year. The city of Oroville has many old orange trees, and it was from faith in these that the two large colonies were planted. The young trees are beginning to bear, and the first oranges shipped from California last fall came from these orchards, ripening some weeks earlier than the oranges at Riverside, nearly 500 miles south. Many olives have also been planted, which grow well and are perfectly free from pests, and promise success.

Some of the largest orchards in California are in Butte County. Part of Riviera orchard lies in Butte. Reed & Johnson, on the river opposite Gridley, have over 400 acres of orchard three years old, and 70 acres of vineyard—table grapes. One half the orchard is peach and pear, the remainder well assorted. The peaches and almonds bore heavily this year. Rock & Hatch have an orchard of 1,600 acres, known as Rio Bonito, lying on the river opposite Biggs. A part of this, now three years old, gave a good crop of peaches and almonds. Alexander & Hammon have an orchard of 400 acres, and W. Treat one of about 200. Thermalito has about 90,000 orange and 9,000 olive trees; Oroville over 20,000 orange and 3,500 olive trees; Wyandotte about 25,000 orange and 11,000 olive trees, with about 160,000 orange and olive trees at Palermo; W. R. Strong & Co. have an orchard of about 400 acres near Palermo; T. B. Hutchins, at Central House, has about 300 acres; Mrs. C. Heffner has 60 acres, and John S. Hutchins 60 acres, with 250 orange trees. At Chico the great orchard of Rancho Chico, owned by Gen. John Bidwell, has about 1,250 acres in bearing. J. H. Guill is a pioneer orchardist of considerable note. Eyrie Villa, a rather noted orchard, planted by Jesse Wood, is now owned by E. J. Le Breton, of San Francisco.

Chico has excellent shipping facilities, and a local cannery makes a home market for much fruit. Some fruit goes north to Oregon and Washington, and regular shipments are made to Eastern cities. So far as I observed, but little fruit is raised on the Sacramento River. Irrigation is only practiced in the colonies where orange trees are planted. All these colonies have a red soil, which requires irrigation. The river bottoms of the Feather need no water for deciduous fruits.

It will thus be seen that in many points Butte is indeed very prominent among the horticultural counties.

Sacramento County.—The Sacramento River, in its course south of Sacramento, and about 20 miles south of that city, divides into several channels, or sloughs, as some of them are called, which are partially

gathered together again before reaching San Francisco Bay, thus making several islands, some of them in Sacramento and some in Solano County. The land is highest at the river bank, and gradually descends to the marsh lands or tules, from one fourth to one half a mile from the river. The islands will be highest on their outer boundaries and lowest in the center. Without the protection of levees there would be but few points along the river banks that would not be completely submerged during high water. A good levee has been built along both banks of the river and around every island. It was found, however, that this levee alone would not protect the tule lands on the eastern side from overflow. Water came in from the Cosumnes River, and in fact there seems to be a regular network of sloughs and channels belonging to the two rivers, and yet communicating with each other. To further protect the land, another levee was constructed on the eastern side of the land to be protected and reclaimed. When all this was done it was found that in times of high water there was such a seepage through the levees that the inclosed land was water-soaked and useless, and some means must be provided to remove it. This is done by means of immense pumps. A drainage district, known as the Pierson District, has a pump standing on the eastern levee, which has a capacity of 130,000 gallons of water per minute. This pump keeps the water from several thousand acres, and a broad tract of the marsh or tule lands, before useless for any purpose, is now dry, and immense crops of vegetables, beans, sweet potatoes, and other crops are raised thereon. A large quantity of the land was owned by the parties who erected the pump. The other parties agreed to pay the sum of \$2 per acre annually for the services of the pump. Sometimes it needs to run only two or three weeks, and one year it was in nearly constant service for six months.

Mr. John Miller, of Tyler Island, built his own levee and provided his own pump, doing the drainage work at a rather smaller expense than the rate charged in the Pierson District. On Grand Island there is a similar arrangement. In time of drought the action of the pump can be reversed and water thrown back on the land. By means of ditches dug from the bank of the Sacramento River toward the drainage pump, the seepage water is carried rapidly away and the land kept in good condition.

For a width of from one fourth of a mile to a mile or more along the Sacramento River and its sloughs the soil is alluvial and mellow, quite deep next the river, but becoming more shallow as it recedes from the bank, till at last it is no more than a foot down to a bed of hardpan. This bed of hardpan is not very thick, and is underlaid by sand. Beyond the shallow soil is the decayed vegetable mold of the tule lands, almost peat-like in texture. This belt of alluvial soil of good depth next to the bank of the Sacramento River and the various channels of its delta constitutes the great Sacramento River fruit district, one of the richest and most important in the world. There is another belt of less extent along the southern bank of the American River, but this is high and dry and requires irrigation to get favorable results. There is another irrigated district about Florin.

There are several decided advantages possessed by the Sacramento River fruit district. Even at ordinary stages of water the surface of the river is nearly the same as that of the land on which the trees are planted, consequently there is never any lack of moisture, while the

perfect drainage never permits water to stand. The Sacramento River is navigable for boats of the stern-wheel order, and by constructing them long enough and broad enough, tremendous loads can be carried at very shallow draught. These boats ply between San Francisco and Sacramento, the first named having 300,000 mouths to fill, and the second the gateway through which nearly all of the fruits of California escape to the East.

Every orchard of any size has its own wharf on the river bank. Early every morning one of these river boats appears at the upper end of the fruit district and begins its down trip, calling at every landing where a flag is shown as a signal that fruit is ready for it. Before the next morning the fruit has been landed on the docks at San Francisco, and is ready for sale. No costly packing is required. If the fruit goes to canneries, it goes in the orchard boxes. Peaches and plums can be shipped in baskets. There is no jolting nor jarring to injure it. The fruit intended for the East is packed and placed on a north-bound boat, from which it is transferred directly to the cars. The American River district is traversed by the Sacramento and Placerville Railroad, connecting directly at Sacramento with the Eastern trains. In this district are the orchards and vineyards of W. R. Strong & Co., George W. Smith, A. B. Humphrey, R. D. Stephens, J. Routier, J. Studarus, the Natoma Vineyard Company, Capt. C. Aull, H. Bendel, U. C. Billingsley, and others, also the Orangevale Colony tract, on the west side of the American River at Folsom, where many orchards are now coming into bearing. There is an old railroad bed from Orangevale to Roseville Junction, which could easily be supplied with iron, and thus connect the colony direct with the North and East.

I can only mention a few of the principal orchards of the Sacramento River district: Hon. Wm. Johnston, W. H. Barry, Geo. A. Smith, O. R. Runyon, W. N. Runyon, Sol. Runyon, C. V. Talmage, Locke & Lavenson, John Miller, H. & P. Crew, A. T. Allender, L. D. Reynolds, Geo. L. Figg, and Mrs. R. Kercheval.

Sacramento City has two active canneries of large capacity. There is also a cannery at the mouth of the river which uses a large amount of fruit.

The celebrated Tragedy prune, which has brought such good prices for the past two years in the East, originated in the orchard of O. R. Runyon, as a seedling of a small, sweet, early plum. It has proved very valuable to the river orchardists. All the districts bear marks of wealth in the shape of fine residences and every comfort.

There are some things to criticise: for instance, the close planting of the trees, not more than sixteen feet apart, which must affect the quality of the fruit; but we expect these people understand better now, and will do differently when they plant again.

In General.—As to insect pests, there is very little to say. I have found them absolutely under control wherever any work has been done in this direction. I found very few parasites preying on scale insects. I was greatly gratified to find that in Butte County the scale had been almost completely annihilated by the twice-stabbed ladybird and other predaceous insects, and this so quietly that only the very closest observers have been aware of the presence of their friends. I can only suggest that orchardists in all the sections observe carefully, and on the appear-

ance of any suspicious insect or symptoms, to communicate at once with the State Board, or some other recognized authority on such matters. Orchardists have really less to contend with than those in any other industry, but horticulture needs attention as much as any other industry.

I noticed quite an interest in the various sections in new fruits. In peaches almost every section has some promising seedling that has either not been introduced at all or to only a limited extent. Thus I found the General Bidwell peach on Rancho Chico; the Levi Cling, in only a limited area, about Newcastle, and the Phillips Cling very sparingly introduced near Marysville. J. H. Guill, of Chico, had a very valuable cling peach that had never gone outside his own place. The Tragedy prune, and its success, show what may be done by experiment in seedlings. I would suggest that every large orchard devote a small amount of space to hybridizing all new varieties for the benefit of the industry.

If these observations, not statistical, shall in any way serve to give an idea of the special features of the section of the State you desired me to observe, the object will be attained.

REPORT OF ALEX. CRAW (QUARANTINE OFFICER), ACTING SPECIAL AGENT.

To the Secretary:

SIR: In accordance with your instructions, I have visited Del Norte, Humboldt, Mendocino, Fresno, and Mariposa Counties, and herewith submit my report upon the horticultural condition and adaptability of those counties for fruit culture:

Del Norte County is the extreme northwestern county of the State, and at present is dependent upon steamer transportation for its products, and this, in a great measure, has prevented the more extensive planting of perishable fruits. With the advent of railroads, providing quicker transportation, I can see no reason why Del Norte County should not become as noted for apples as it now is for its dairy products. The soil and climate are well adapted for the profitable cultivation of the apple and small fruits. The planting of late-keeping red apples would certainly be a paying industry, for in this county the fruit keeps solid, and is of an excellent quality until midsummer.

The first orchards were planted nearly forty years ago, and are still productive, although, in most instances, they are not cultivated or pruned. The younger orchards are in better condition, and are giving promise of profitable returns. This appears to be the home of small fruits, the rich, moist soil producing a vigorous growth, and a heavy yield of berries. In the Smith River Valley I saw a most remarkable growth and heavy crop of cultivated blackberries, and I doubt if its equal can be found in any other section. There are blackberries, raspberries, salmonberries, and gooseberries indigenous to this portion of the State, and the fruit of each is produced in abundance; but with the exception of the former, very little of the fruit is used.

The extent of cleared land is very limited, being confined principally to the Smith River Valley and a strip along the foot of the hills near Crescent City, known as Elk Valley. The balance of the county is mountainous and mostly heavily timbered with redwood (*Sequoia sem-*

pervirens). Smith River Valley contains about 18,000 acres of fertile, well-sheltered land, and most of it well adapted to the cultivation of the apple, plum, cherry, and berries. In this valley are some of the oldest orchards in the county. One of 10 acres, known as the "Reservation," was planted in the early fifties. The varieties are Baldwin, Rhode Island Greening, Yellow Newtown Pippin, Spitzenberg, Yellow Bellflower, and Roxbury Russet. The trees generally are doing well and bear heavy crops; but the ground under the trees is in pasture, and is in marked contrast to the well-tilled orchards of the State where fruit growing is the paramount industry.

The town of Smith River stands next in population to Crescent City, and is a clean, prosperous little burg, and delightfully located, nestling between the mountains at the head of the valley, near the confluence of Rowdy and Dominick Creeks with Smith River. Here was built and is still standing one of the first flour mills constructed in the State, that furnished flour for the large mining population then at work in the interior. In recent years the farmers have found it more profitable to convert their wheat fields into clover pastures, which produce the gilt-edged butter of the San Francisco market.

A large acreage is annually seeded to oats, which grow and yield well in the moist, rich soil of the foothills and valleys. The same land planted with choice winter apples, well cared for and in full bearing, would annually produce fruit to the value of \$100 to \$300 per acre, as the apples would come into market at a season when only citrus fruits are plentiful. This should be a strong inducement for farmers to give more attention and care to apple culture. The fruit is not so perishable as the cherry or plum, will stand transportation better, and on this account should have the preference.

As an evidence of the mildness of the winters, I may mention that I saw white and purple fuchsias 10 feet high, and other equally delicate plants that live out of doors without any protection.

Inland and above the fog belt, Horace Gasquet, of Gasquet, has planted and is growing successfully, grapes, peaches, apricots, cherries, plums, prunes and pears of excellent quality, that meet with ready sale in Crescent City.

The throwing open of the Klamath Reservation for public preemption will add materially to the prosperity of the county. A railroad has been built from Crescent City through the redwood forests to Smith River. This is a charming ride. The giant trees on either side of the road, with their verdant undergrowth of ferns and moss, the trickling springs from the banks, the running streams in the cañons, with an occasional grassy glade over which the sunbeams steal, make a landscape that is truly enchanting, and where the student and lover of nature can find much of interest.

Humboldt County is rapidly coming to the front in horticultural matters, and no mistakes need now be made in planting fruit, the pioneers having planted a few trees of nearly all the deciduous fruits, so that a visit to one or more of the bearing orchards will assist intending planters in determining the variety of fruit best adapted to his soil and location.

As an apple section Humboldt is, in my opinion, one of the best counties in the State. Up the Eel River Valley, a short distance from the

coast, the trees are vigorous and very productive, and a failure of the crop has not occurred in over twenty years, showing that the conditions are unquestionably favorable. The pioneer orchards here, like the early orchards in other parts of the State, contain too great a variety for profit, commission men preferring and paying more for a leading kind in bulk than they would for the same quantity of fruit, but made up of a number of varieties. Even with a mixed orchard the returns are very encouraging. One old orchard of 10 acres in this valley netted the proprietor \$200 per acre the past season; another orchard of 3 acres cleared the snug sum of \$300 per acre. Other valleys and sections of the county have equally satisfactory returns from fruit.

A short line of railroad runs up the Eel River Valley, and furnishes rapid transportation to the seaboard at Eureka, where the produce is loaded on steamers for San Francisco. But what is wanted to stimulate fruit planting is rail connection with the balance of the State. Humboldt's natural resources are so varied and great that the seemingly impenetrable barrier of mountains will not long prevent the construction of one or more railroads. The National Government's recent liberal appropriation of \$1,700,000 for the improvement of Humboldt Bay will be an additional incentive for railroad corporations to reach a deep-water harbor at this portion of the State, and more especially as it is the only commodious one north of San Francisco.

The farmers and fruit growers should not await the building of overland railroads, for they certainly will reach and penetrate the county in every direction. They should plant every available acre to the fruit best adapted to the locality. From my observations in the county, I would recommend that the apple be given preference, and in quantities to make Humboldt County as famous for its fine keeping winter apples as the southern counties are noted for their oranges and lemons. With a soil and climate that will produce apples that will keep without any special care until the end of July, there is nothing but a lack of enterprise upon the part of the land owners that will prevent Humboldt from taking the lead as the banner apple county of the State.

I was pleased to note the interest in, and care taken of, most of the orchards of the county, and the evident desire to plant new tracts or extend the old plantings.

Three nurseries keep a good stock of clean, healthy trees to supply the local demands, and also some for the outside trade. The trees can be purchased as cheaply as imported stock, and planters prefer them, as they are already acclimated, and they run no risk of introducing new pests or diseases, which is a very important consideration in a new fruit district. In this connection I may here state that the county has a very efficient Board of Horticultural Commissioners and inspectors, who carefully examine all imported fruit and trees. The value of their work to the county can hardly be estimated, for the destruction of infested trees will save the fruit growers hundreds of dollars in the future.

Several orchards have been planted upon land that but recently was a dense forest. The expense of blasting or grubbing out the stumps and roots of the once gigantic trees is quite too great, so the fruit trees are planted amongst the stumps, that in time will decay and enrich the soil, although that already contains all the necessary ingredients for producing the very best quality of fruit. The healthy, vigorous appearance of the trees is a good indication of the fertility of the soil. The only

objection to this system is the unsightliness of the blackened or charred stumps. But again, unless the expense of clearing the land is incurred the immense stumps remain, so the planting of fruit trees helps to some extent to cover up this blemish. This land should not remain unproductive, and as it can be bought cheap, it offers men of limited means an opportunity to purchase real estate that is certain to increase in value, besides making handsome annual returns for the labor and capital invested.

The town of Fortuna has an establishment opened up for business this season that will be almost as great a factor in developing the resources of that portion of the county as would the building of additional railroads, and that is a canning factory. It will not only build up the town, but it provides a home market where perishable fruit can be prepared for shipment to any part of the world. The culture of small fruits, already a prominent industry in the Eel River Valley, where they all grow to perfection, will receive an additional stimulus in order to supply the demand. Besides small fruits, green peas, asparagus, and other vegetables that thrive here can be put up, and with an abundance of cheap fuel, evaporated apples and other fruits can be prepared and packed, and thereby extend the working season in the factory.

Rohnerville is the center of the principal fruit section of the county, located near the foothills on the east side of Eel River, and is surrounded by such towns and noted fruit districts as Hydesville, Van Duzen Creek, Alton, Grizzly Bluff, and Fortuna. This region is also famed for its agricultural resources. Prunes are very productive in this section, and of good quality, the trees being bent down with their enormous loads. Cherries are at home; the fruit matures fully one month after the same varieties in the central portion of the State, and with quicker transportation facilities, so that they would reach San Francisco in good condition, they would practically have the market to themselves, or they could be profitably used in the cannery.

Upon an eminence near Rohnerville, and overlooking Alton, stands St. Joseph's College, from the roof of which is obtained one of the grandest views in the State. The Father in charge has traveled all over Switzerland, and declares there is nothing to compare with it. The picturesque Eel River, with its sparkling tributaries, can be traced for miles, along either side of which are dotted fertile farms with their varying tints, from green to gold, the broad meadows and undulating foothills backed by the higher ridges, covered with dense forests of straight and majestic redwoods, and, in the distance, the blue waters of the broad Pacific can be seen glistening in the rays of the setting sun, forming a panorama that will remain with the beholder as long as memory lasts.

Around Arcata is another good fruit section, but the land is principally devoted to agriculture and dairying. Here, as at Ferndale, luxuriant meadows of clover can be seen, growing without irrigation, from which two to four crops of nutritious hay are cut annually. Nearly all the farmers in these districts have their home orchards, that add to the beauty and prosperity of the section.

Camp Grant, Garberville, and Blocksburg are coming to the front as fruit-producing sections. Here peaches, pears, and grapes of excellent quality are produced, and new orchards are yearly being added. Fruit raising upon a more extensive scale has been started the past winter.

The possibility of a profitable industry on a large scale was conceived by several enterprising business men in Eureka, stimulated by the healthy and productive small orchards grown without irrigation around Blocksburg, and a body of 320 acres of very fine fruit land was purchased; and under the name of the Southern Humboldt Orchard Company, they have planted 47 acres to prunes and several acres to other fruits.

A private nursery has also been started by this company, to grow trees for the balance of their property.

Mendocino County is fast becoming famous for its fruit products. The northern portion of the county is mountainous, interspersed with small productive valleys, with an occasional orchard that shows the fertility of the soil and what can be done in fruit growing. As you come south and nearer the railroad the signs of energy and enterprise are more evident. Little Lake Valley is located near the center of the county, and the town of Willits is the business center of that fertile and beautiful valley. Here fruit growing has received an impetus by the example and energy of the California Land, Fruit, and Commercial Company, who saw in this section all the necessary conditions for a profitable orchard upon an extensive scale. Nearly 1,300 acres of land were purchased by this company, and of this about 200 acres have been planted to prunes, apples, pears, and peaches, that have made a remarkable growth, with hardly a tree missing in the tract. Besides this orchard, the company have in nursery over 100,000 budded and grafted trees that have done equally well; these trees will be planted upon the company's land. This promising investment is under the able direction and supervision of J. Luther Bowers.

Several old orchards in the valley, from their productiveness and quality of the fruit, give the assurance that this district will be better known in the near future when the extensive young orchards come into bearing.

The soil of the valley is a rich, sandy loam, with occasionally a few acres of heavy, dark soil. Along the foothills is found excellent reddish loam, suitable for the growth of the peach.

The immense oak trees that are scattered over the valley have a very pleasing effect, giving to the landscape the appearance of a vast park. As you come farther south you enter the beautiful Ukiah Valley, with its bright green hopvines spread out over horizontal wire espaliers that give the hop fields a trimmer appearance than where the crooked, unsightly poles are used to support the vines.

Here small vineyards are also noticeable along the hillsides, indicating a warmer condition of soil. These are principally wine grapes. In this valley the prune has been extensively planted the past four years. The reason for this I could see in the enormous yield of the older orchards. Judge McGarvey and E. W. King have as fine young bearing prune orchards as can be found in the State. The trees are eight to ten years old, and are marvels, producing heavily a superior quality and an extra fine grade of fruit. I am informed that the fruit dries heavily, being less watery, only requiring two and a half pounds of fresh prunes to make one of dried. The warm, dry fall months make the curing a simple process, and dispenses with the cost of fuel, as the sunshine is sufficient for this purpose.

Winter Nelis pears, as far as my observation went, are entirely free from the pear cracking and leaf blight fungus. The Bartlett pear and other kinds also do well; but where the soil is suitable in the Ukiah Valley, I would recommend the planting of Winter Nelis; not only is it free from disease, but it also bears heavy crops, and, as the price paid for choice Winter Nelis pears in their season is almost double that paid for the best Bartletts, they should receive more attention from orchardists. T. J. Fine has Bartlett trees that are twenty-five years old which would average half a ton of fruit to the tree.

N. Wagon seller, one of the pioneer fruit men of the valley, evidently has faith in pears and prunes, for he has planted 25 acres of young trees that are doing well. The rest of the fruit sections of the county are rapidly extending their acreage in trees, so that in time Mendocino County will have a recognized standing with other fruit counties of our wonderful State.

Another industry that keeps the name of California before the lovers of flowers, is that of collecting and propagating our beautiful native lilies, and other bulbs, that grow so luxuriantly on the hills and in the cañons of the State. This business is conducted by the well-known botanist, Carl Purdy, of Ukiah, who has a staff of trained collectors in nearly every county of the State. These bulbs are not only sent all over the United States, but large shipments are annually sent to Europe, where they are in demand.

Fresno County is the banner raisin county of the State. The word "raisin" is so associated with this locality that it leads people to infer that no other fruits will thrive or are planted in this county; but a visit to the county or a glance at the fruit statistics to be found in the present volume, will soon dispel that impression. The location of this county is in the center of the great San Joaquin Valley (which it crosses), and extends into the high Sierra Nevada Mountains, has an area of nearly 13,000 square miles, and an elevation of from 200 feet above the level of the ocean to the summit of the lofty Sierra. Here every imaginable climate can be found which is suitable for nearly every variety of fruit, from the delicate orange and lemon, to be found in the thermal belt of the foothills, to the vine in the plains and the hardy apple in the mountains. Such in brief is Fresno County—an empire in itself.

The culture of the peach is now receiving more attention in this county, and the conditions and soil suitable for its development are better understood. In some soils the trees do not prosper, not having the necessary conditions, but raisins and pears have proved a success. This is so in portions of Central Colony, and also in portions of Washington Colony; whereas, Selma, Fowler, Clifton, Madera, Fruitvale, and east of Fresno, the soil generally is well adapted to peach culture, and the trees are long-lived and abundant bearers. This branch of horticulture is destined to become one of the most profitable in the county, for the fruit can be shipped green, canned, or dried. The almost total absence of fog and dryness of the climate are the necessary conditions for making a good quality of dried fruit. This and the richness of the soil have made Fresno raisins famous.

In planting peaches for drying purposes, varieties should be selected that mature before the raisin grapes are ready for picking. This will

make a longer working season, and will insure the location of help that have become experts among dried fruits.

As a rule the orchards and vineyards are very well cared for, and it is not necessary to refer to any in particular.

What has contributed to make Fresno prosperous is the great number of families owning 10 and 20 acres who have located within her borders.

Pears do well, and have been largely shipped this season in carload lots to the Eastern States. The fruit is high colored and of fine quality.

Figs grow and bear well, and several growers are devoting a great deal of attention to the preparation of this fruit, and are progressing.

Prunes do remarkably well, but have not been planted as extensively as they have in some other counties.

Olives do well. An orchard of 15 acres, the property of the Madera Vineyard Company, is as clean and productive an orchard of its age as can be found in the State.

F. Roeding, of Fresno, is devoting considerable attention to the olive. He has planted 75 acres, and considers this will become a profitable industry.

Fresno's orange groves are not very extensive as yet, and this is very strange, with the evidence of success that has been before them for years. In a few places along the foothills can be found trees that for size, cleanliness, and quality of fruit cannot be excelled, for their age. Trees that are twenty years old, and averaging over 3,000 oranges to the tree, which sell wholesale for 1½ cents each, have convinced several enterprising citizens, who have taken the trouble to investigate the back country, that there is money in oranges. So several young orchards have been planted, and have passed through the winter without protection, and the past winter was one of the coldest experienced for years. The young growth and foliage is vigorous and deep green. A few Eureka lemon trees were planted three years ago, and are now fine trees, full of bloom and fruit in various stages.

A nurseryman experienced in orange growing visited the district last winter, and recognizing the adaptability of the soil for citrus fruits, and the wonderful growth and abundance of water for irrigation, purchased land, and has established a nursery of 78,000 orange trees. These are doing well. Several small orange orchards have been planted on the plains near Fresno City. I would not advise the extensive planting of citrus fruits so far down, but if any one desires to have a few trees he should select good-sized seedling trees—trees that have been raised from select California seedling oranges, as they are hardier and make larger trees than budded fruit. Another nursery that makes a specialty of orange trees has been established at Sanger.

Apples are grown in nearly all the fruit sections of the valley, but for choice, good keeping fruit a higher elevation is required, and such land can be found in abundance, but it is somewhat inaccessible. The principal apple sections are Fresno Flat, Gertrude, Toll House, and Pine Ridge. Two large shipments were received in San Francisco last spring from Gertrude that brought fancy prices.

The irrigation facilities of Fresno County are considered the best in the State. Having two large rivers (San Joaquin and Kings) that head in the Sierra amongst perpetual snow, the supply of water is abundant. The greatest flow is from May to July, and this is the season when water is required for the principal crops. Less water is required now

than formerly, sub-irrigation being found sufficient in portions of the county.

In *Mariposa County*, during the mining excitement, a great many small orchards were planted, which brought their owners the fancy prices that were realized in the days of gold. Until the past two seasons very little new acreage of fruit trees has been added. This has not been caused by any unfavorable conditions of soil or climate, but must be ascribed to the lack of a home market and the difficulty and distance of hauling the fruit to the railroad. These are the great obstacles that have confronted the settlers and others who would select Mariposa County wherein to engage in fruit growing. The construction of a branch railroad through the county into the beautiful Yosemite Valley, which is located in the eastern portion thereof, would give an easy outlet for Mariposa's products, besides carrying thousands of strangers to visit the Yosemite, who are now debarred from doing so by the fear of a long stage ride. Until this serious drawback (lack of transportation) is overcome, Mariposa's progress in fruit culture will be very slow.

The county is hilly and mountainous, with small fertile valleys in which some of the old orchards are located, the old mining ditches serving to conduct the water for irrigation purposes.

There are a number of comfortable homes with orchards in the mountains, where a very superior quality of fruit is produced. Apples and pears in the orchard of T. J. Cowan, near Grant Springs, cannot be surpassed in quality. The trees in the orchard were propped to prevent them breaking down.

P. P. & C. L. Mast have faith in their section, as they have planted quite an extensive orchard; the leading fruits are: 1,500 prunes, 1,000 olives, 800 almonds, 750 oranges, 450 peaches, 33,000 raisin grapes, besides a variety of other fruits planted for experimental purposes. A portion of this orchard was planted in 1890, and the balance the following year, and already some of the trees are bearing.

In the town of Mariposa are some of the old-time orchards, which are still thrifty and productive. The soil is of that reddish character peculiar to gold-producing sections, and with irrigation is the very best of fruit soil. A few old and very large fig trees and grapevines are growing near old mining claims, of which it would be interesting to know the history—their planting and subsequent care, who were and what has become of those California pioneers and miner-horticulturists. They probably never thought, while resting in the grateful shade of the trees, that in a few short years their own native States, or homes in Europe, would be supplied with fresh, canned, or dried fruits from far-away California.

The principal fruit growers of the county are: J. M. Harris, Grants Springs; P. P. & C. L. Mast, Coulterville; L. E. Grove, T. J. Cowan, and W. L. McPherson, Grants Springs; J. W. Snyder, John Mathews, and S. J. Harris, Jersey Dale; A. G. Black, H. S. Stockton, and Anton Camin, Hornitos; Daneri & Denegri, Frank Herbeck, James Lindsey, and W. H. Dudley, Coulterville; G. C. Wills and H. W. Cornett, Cathay, and Thomas Davey, Darrah.

REPORT OF ED. M. EHRHORN, SPECIAL AGENT.

To the Secretary:

SIR: According to your instructions, I have visited the counties of Marin, Sonoma, Napa, Lake, Glenn, Colusa, Yolo, and Solano, and herewith submit my report on the horticultural condition and progress of these counties.

Marin County is principally devoted to dairying, this industry far overshadowing all others. Land here is held in large bodies and is leased to individual dairymen, who make a business of supplying the San Francisco market with their products.

The climate is moist, and the grass and forage are green the whole year. There are, however, a number of important orchards in Marin, chief of which is that of the Hon. Frank C. DeLong, covering 300 acres, 175 acres of which are in apples. This, besides being the largest orchard in the county, is also the oldest, having been in continuous bearing since the fifties. The principal variety of apples in this orchard are the Yellow Newtown Pippin, Spitzenberg, Winesap, Roxbury Russet, White Winter Pearmain, Baldwin, and others. Its product is largely shipped to Australia. All the apples are carefully packed for shipment, each apple being wrapped in paper after being thoroughly examined. The inferior fruit is manufactured into cider and vinegar.

The apple is the leading fruit of Marin County, and seems to flourish well, but other fruits are also grown, among them, peaches, plums, and grapes, all of which do well; even the delicate orange grows in some of the more sheltered places.

The principal fruit regions of Marin are found around Novato and Tomales, but there are many other parts of the county where fruits would do well, and the industry is rapidly increasing. The orchards generally are in good condition, and the yield of fruit for the present season is fair. Peaches will return nearly a full crop, apples and pears are about half a crop, and other fruits are about average. The prices of the different fruits were as follows: apples, from 90 cents to \$1 25 per box; peaches and pears, from \$30 to \$40 per ton; plums, \$20 to \$30 per ton, and cherries, from 5 cents to 7 cents per pound.

The soil is very largely a clayey loam and adobe, and ranges in value, according to locality, from \$50 to \$150 per acre.

Sonoma County was one of the first in California in which the fruit industry obtained a foothold. Largely devoted to vine growing, it is to-day the first wine county of the State. While the vine holds first place in Sonoma's fruit interests, other classes are not neglected, and large amounts of apples, cherries, apricots, figs, peaches, prunes, olives, and nuts are grown and exported from here; even citrus fruits thrive in some localities and have yielded fruit for the past ten years. Besides these, very large quantities of small fruits, berries, and table grapes find their way to market from Sonoma County.

The oldest orchards in this county are those planted in 1812 by the Russians at Fort Ross. There are still some of the apple trees living, and, although covered with moss, have good apples every year. This is good proof that the apple will thrive well along the coast. When these old trees were planted the Russians planted some apricots, pears, cher-

ries, and vines, but all these fruits have either been destroyed or have died long ago.

Among other old orchards some at Sonoma are worth mentioning. Mr. Griffith planted an orchard in 1839 or 1840, which consisted mostly of apples and pears; the trees were brought from Oregon. Mr. Ryan also planted an orchard in 1850, and got Mr. Griffith to send for some trees from Oregon, which he did. This last orchard is still in good condition, and some of the original stock is still producing fruit every year. The old orchard was divided, Mr. J. Watts owning one portion and Messrs. Howe & Hall the other. Some of the finest apples are yet produced in the Watt orchard, and an apricot tree still yields a large crop every year. A number of black fig trees are also in the original orchard; these are some of the old Mission stock.

The sections most devoted to fruit in Sonoma are Petaluma, Santa Rosa, Sebastopol, Green Valley, Cloverdale, Sonoma, and Russian River Valley. Sonoma, Petaluma, Santa Rosa, and Healdsburg are the principal shipping points.

The principal fruits are apples, pears, cherries, peaches, prunes, quinces, and apricots.

The soils vary from adobe and gravelly loam to a light red soil in the hills. The crops are generally light; the average will run about two thirds of a crop. Prices were good and were as follows: apples, from \$1 to \$1 25 per box; pears, 1½ cents f. o. b.; cherries, 7 cents f. o. b.; peaches, and apricots, \$30 per ton; prunes, \$40 per ton, and plums \$20 per ton. Most of the fruit is marketed green. Mr. Howe has 20 acres in quinces, which are shipped East and bring a good price. It is only lately that this has been tried, and the demand for this fruit is increasing.

At Glen Ellen wine growing is the chief industry, but the orchards here, while neither numerous nor extensive, look well. At Los Guillicos fruit growing has taken a firm foothold, olives being the favorite. The trees here present a healthy appearance.

In the vicinity of Santa Rosa are about 2,000 acres in orchard, principally in prunes, pears, peaches, and apples. There are two canneries in operation here, which give employment to about 800 people. The output of one of the canneries last year was about 50,000 cases of different fruits, mostly peaches, apricots, pears, plums, cherries, grapes, and berries. About 70 carloads of dried fruit were shipped by this company. The other company put up about 65,000 cases of the same kinds of fruits. Both factories are situated on the railroad, and handle fruits from other sections of the State as well.

A great drawback to some parts of this section are the large grants situated between Santa Rosa and Sebastopol. These large tracts of land always prove a detriment to any horticultural locality, as they restrain an increase of the settlement of those who would become fruit growers, and break up the country with broad stretches of land, which are not profitable to cultivators nor ornaments to the section.

Crops in this district are light, and on an average about one third. A full crop of apples is anticipated. Prices are good, and the fortunate growers who have a crop are rushing about to get the top prices of the market.

The soil here is a sandy loam and very rich, and no irrigation is needed.

Analy township, of which Sebastopol is the shipping point, has about

1,000 acres of peaches, 800 of apple, and 800 of prune. There are also about 1,000 acres of mixed fruits and vines. Besides these there are about 200 acres of berries planted. This section seems to be well adapted to small fruits, and they are in great demand, being of the best quality. A 5-acre lot of blackberries yielded 18 tons of berries, which sold on the ground, picked, for \$62 50 per ton, returning a nice little income to the grower. Among the small fruits blackberries take the lead, but raspberries, currants, strawberries, and gooseberries grow luxuriantly. The last mentioned attain the size of a small walnut. Besides the fruits mentioned, a few olives, oranges, and walnuts have been planted, but not in paying quantities.

No irrigation is needed, and the soil, which is a sandy, gravelly loam, with a clay subsoil, is very fertile. In several of the wells which have been dug, a strata of hard, gray sandstone was found at about 80 feet below the surface, in which there are sea-shells. Water can be obtained at 20 feet from the surface. The land in this section sells for from \$35 to \$350 per acre, according to quality, location, and improvements.

A cannery was built last year, and is now canning the different fruits, employing from 400 to 500 people. The company expects to put up 8,600 cases of fruit.

Crops are light, and the returns will be about a half a crop of peaches and about a third of apples and pears. Prices of the different fruits are: pears, \$30 a ton; peaches, from \$30 to \$35 a ton; cherries, 4 cents to 6 cents per pound; prunes, \$40 a ton; blackberries, 3 cents to 5 cents; raspberries, 5 cents to 6 cents per pound; apples bring from 40 cents to \$1 25 per box, according to grade.

At Healdsburg and vicinity there are about 1,200 acres in peaches, about 1,000 acres in prunes, and about 800 acres in other varieties, such as apples, cherries, apricots, etc. The industry has taken good foothold, and three large canneries, the Magnolia, Van Allen, and Russian River canneries are established here. These companies employ from 1,000 to 1,200 people, and a great many families come from Mendocino and Lake Counties to open camp near these factories to get employment during the season. A large quantity of fruit from other sections of the county is shipped to Healdsburg to be canned.

Cloverdale is the principal fruit center of the northern part of Sonoma County. Here the wine interest is of course the leading one, although the fruit business is rapidly increasing, about 700 acres of fruit, mostly peaches, cherries, pears, and prunes, having been planted. Apricots do not grow well in this section. Some parties have planted figs, olives, and oranges, and expect good results. The markets at present are San Francisco and Healdsburg, and the fruit is handled green and dried. Prices for the different kinds this season were as follows: apples, from 40 cents to \$1 25 per box; cherries, for white varieties, from 7 to 9 cents; for black varieties, from 5 to 6 cents per pound; peaches, from 1½ to 1¾ cents, and pears 1½ cents per pound.

The soil varies from a sandy loam to a heavy adobe.

At Petaluma the extent of orchards is about 1,200 acres. These are mostly small holdings; some are only used for home purposes. The main fruits are apples, apricots, pears, peaches, and plums. The shipments are made by rail East, or by way of Petaluma Creek and San Francisco Bay on boats, which take large quantities of fruit and vegetables to the San Francisco market.

A large cannery here handles most of the fruit of this section, and also some of Marin County, putting up four grades. The finest quality is put up in glass jars, and the fruit is well packed, so that the jar always has a good appearance and does not look half filled, which is generally the case in this line of canning. A very unique establishment is the Sonoma Preserve Company, of which Messrs. Sanborn & Co. are proprietors. This company preserves mostly jellies, jams, pickles, sauces, catsups, and relishes. It will in time become quite an industry, and large quantities of fruits and vegetables will no doubt find their way to market in the above forms. One month's sales amounted to about \$7,000.

The oldest orchard in this section is on St. Antone Creek, and is about thirty-seven years old, consisting mostly of apples and pears. Some of these pear trees bear 16 boxes to the tree. P. Sweeney, the owner, planted seeds and got his buds from some of the old Missions. The varieties were mostly Seckel and Pound pears. Most of the trees are now grafted into Bartlett's, and this variety grows very well in this section.

Napa County, like Sonoma, is a wine county, and the orchard industry holds a second place. In the last few years, however, this latter industry has received more attention, and some of the vineyards have been replaced by orchards. Apparently it promises to excel the wine industry in the near future.

Prune culture is the favorite branch of the fruit industry here, and several parties are already handling the dried product in large quantities. Among the main fruits grown are peaches, prunes, plums, cherries, apples, and pears.

The variety of prune most commonly used is the Petit d'Agen, although of late the Robe de Sargent is coming into favor. The Petit prune succeeds best on peach or almond root in warm, well-drained soils, and in heavy, moist soils the Myrobalan root is preferred. All trees are headed about 18 or 20 inches from the ground. The peach is the second fruit on the list, and the following varieties seem to be the favorites: Early varieties—Alexander, Hale's Early, and Early Crawford; late varieties—Susquehanna, Muir, Salway, Sellers, and McKevitt Clings. Some olives and walnuts have been planted, but the trees have as yet not come into full bearing. In some of the sheltered nooks of the mountain slopes citrus fruits do well and make vigorous growth. The soil is always moist and irrigation is not needed. Among the principal growers are T. Parrott, Beringer Bros., and George H. Beach, of St. Helena; S. Kellett, P. R. Schmidt, Dr. Beverly Cole, and Mr. J. W. Roberts, of Calistoga. There are also some fine trees near Napa City. On Hon. M. M. Estee's place, and the Sackett place, are some old trees which bear good crops every year.

The principal fruit sections are Napa Valley, Berryessa Valley, Pope Valley, and Browns Valley. In the upper part of the county the fruit centers are St. Helena and Calistoga. The orchards as a rule look well, and the owners seem to take pride in them. In general there seems to be no complaint of insects troubling the trees.

Some of the oldest orchards in Napa County are Thompson's orchard, near Suscol; Drury Melone's, at Oak Knoll; Lewelling's, near St. Helena; H. W. Crabb's, Oakville; H. C. Deitrich and John Steckler's, of Ruthersford, and others.

The varieties planted are apples, pears, cherries, and plums. Most of these were brought from the Eastern States, and also some propagated from the old Missions.

The crop outlook for the present season is, for prunes about one third, peaches two thirds, pears a good crop, and cherries two thirds. Early frosts caused the grape crop to suffer, and only one third of a crop is anticipated. Prices are good, peaches bringing \$35 to \$40, prunes \$40, and pears \$30 to \$35 per ton, and cherries from 6 to 8 cents per pound.

The soil is very rich, varying from the light, loose soils of the foothills to the gravelly loams and adobes of the valleys. Land sells for from \$50 to \$600 per acre, according to location, quality, and improvements.

The county as a whole is in very fair condition, and promises in a few years to become one of the leading fruit sections of the State.

Lake County was originally the northern part of Napa County, but being naturally divided from it by mountains, it was made a separate county in 1861. Lake is one of the unfortunate counties, being cut off from direct communications, having no railroads. The whole county lies between two main branches of the Coast Range, those on the east being known as the Bear Mountains, and those on the west are a continuation of the Mayacamas. Spurs connect the two ranges. Thus inclosed on all sides by mountains, this county has the most natural boundaries of any county in the State. "The Switzerland of America," as the county is justly called, has a great many small valleys, which are each surrounded by mountain spurs. In these valleys are famous lakes—Upper Lake, Lower Lake, and Middle Lake—which give the county its name.

The fruit industry here is as yet in its infancy, and will no doubt remain so until better transportation facilities are obtained, so as to ship the products to outside markets. At present the fruits grown in this county are used for home consumption, except apples, which will be spoken of later. Nature has given this county a wonderful supply of water, and especially has caused a number of very fine mineral springs to flow. These springs have created a great many watering places, where invalids and those seeking rest can find comfortable accommodations at the well-kept hotels. Most of the fruits are used at these places during the season. Quicksilver mining has increased largely of late, and no doubt the miners will increase the demand for fruits.

The principal fruit sections are Big Valley, Bachelor Valley, and Scott Valley. The main fruit centers are Lakeport, Upper Lake, Lower Lake, Middletown, and Kelseyville.

Big Valley is the largest tract of agricultural land in the county, lying south of Lakeport, and has large fields of hay and grain, and in the very center large pasturage for stock. In this section there are some fine orchards, and although young promise a great future for the county. Kelseyville is in the southeastern part of Big Valley, and is about three miles distant from Clear Lake. The prune industry has been tried there, and so far is very encouraging; the principal fruit regions are the rolling lands and higher hills on the southeast side of this section. Drying fruit has been tried, but the climate will not permit growers to rely on the sun, and experiments with evaporators have been carried

on. Besides the prune, apples, pears, peaches, apricots, and cherries are grown in numbers.

Bachelor Valley, running due west from Upper Lake, is also a good prune section. This valley is about 6 miles long. The rolling hillsides are well adapted to raisin and wine grapes.

Scott Valley runs in a northwesterly direction from Lakeport, and is larger than the preceding valley. The same can here be said in regard to the various fruits.

Lower Lake is the trade center of several small valleys, all of which have small holdings in the fruit line. Lower Lake Valley lies at the extreme south end of Clear Lake. This is one of the few accessible points for railroads to enter Lake County. Cache Creek runs through deep cañons into Yolo County, and through these cañons the road will have to be built.

Middletown and vicinity are in the southern extremity of Lake County, and include the Loconoma and Coyote Valleys. Middletown is about 16 miles from Calistoga, and is also a point where a railroad could reach the center of the county. A few experiments here in fruit culture have given great satisfaction, and people are awakening to the fact that this is going to become one of their leading industries. Apples, pears, peaches, prunes, and berries seem to thrive. Olives have also been planted, and promise a great future. The Bradford quicksilver mines are located near here, and give employment to large numbers of people, and no doubt a good quantity of fruit will find a ready market there.

All the orchards are well cared for, and the trees and vines look healthy and vigorous. The only fruit that is shipped in quantities to outside markets is the apple. Some of the finest apples are grown in the different sections of the county, and have good keeping qualities. The principal market is Colusa, and last year about 1,000 tons were hauled over the mountains to their destinations. These apples brought from \$1 to \$1 25 per box.

The valley lands are well adapted to small fruits, and blackberries, strawberries, and raspberries take the lead. These fruits are of superior quality and grow very large in size, but are only grown to supply home consumption.

The oldest trees in the county are about thirty-five years old, being apples and pears. These are still standing and furnish the owner with a winter supply.

The soils of this county are varied in quality. The bottom lands are rich, sandy loam, and splendid vegetable and berry lands. In the hills the soil is red and of volcanic origin.

Glenn County is the youngest county in the State, having been segregated from the upper part of Colusa County in 1891. The leading industry is wheat growing, but within the last three years a great many orchards have been planted.

The principal sections are Fruto, Elk Creek, Orland, Princeton, and Butte City. Fruto is the terminus of the Willows and Mendocino Railroad, and it has quite a colony of fruit growers, who have built for themselves beautiful homes.

The soils vary from a rich clay to a gravelly loam, and prunes, peaches, pears, apricots, figs, olives, almonds, berries, wine and table grapes

grow luxuriantly, when well cared for. Elk Creek is quite a fruit section, but as yet no railroad connects it with the main line. A good road is the means of transportation to Fruto. Here the apple grows well, and is the promising fruit, although prunes, peaches, and pears have also been planted.

Orland, and the region tributary thereto, is devoted chiefly to wheat growing. Of late fruit culture has taken good foothold. The only drawback to the section is the lack of water, and this ere long will be supplied, as an irrigation district has been organized, and will soon furnish an abundant supply. Some orange trees have been planted, and are doing well.

Princeton and Butte City are in the southeastern part of the county, on the Sacramento River. It is needless to say that this section is very productive. The shipping facilities are good, and transportation companies have steamers and barges on the river to haul the products.

The oldest orchards in this county are small home orchards of the farmers. These are generally small holdings, and many are scattered through the valleys. Some of these were planted in the early fifties.

Colusa County is chiefly a wheat county. Although in the heart of the great Sacramento Valley, it has as yet a limited acreage of fruits and vines. Large tracts of land well adapted to this industry are in the hands of those who pay no attention to it. A large irrigating system has been built, that will supply the necessary water for irrigation purposes. The lands are very fertile, and with water any of the principal fruits can be raised successfully. A very important feature of the county is the favorable communication it has with the rest of the State. The Colusa and Lake Railroad connects with the Northern Railway, and the Sacramento River is navigable far up into the county. Freights are comparatively low, which helps the industry materially. With more small farms, instead of leagues of land in one body, Colusa would surely prosper.

Although this county is mostly a vast level, there are some attractive views in the hills and along the river. The banks of the Sacramento are lined with beautiful trees, and these are very often covered with the beautiful wild vines for which the Sacramento Valley is noted.

The principal fruit sections are Colusa and vicinity, along the river, and College City and Arbuckle. At Colusa and vicinity all deciduous fruits grow luxuriantly, and quite a number of small orange groves have been planted and do not seem to be affected by frosts. The soil here is a rich river bottom, varying from sandy loam to heavy gray soil.

Along the river winter irrigation is practiced on a large scale. When the river rises it is, of course, higher than the land, and the growers have ditches from a dyke which lead through the orchards; through a large gate at the dyke the water is supplied. This year some growers have dug deep wells and have tried summer irrigation. They use a four or five-inch centrifugal pump to lift the water, which is then carried off in small furrows along the trees.

The Colusa Canning, Drying, and Packing Company handles most of the products of this locality, giving employment to about 200 people. The output last year amounted to about 4,500 cases of different fruits.

College City is three miles distant from Arbuckle, which is on the

Northern Pacific Railroad. It is a good raisin district, and the industry is increasing. At Arbuckle the apricot and prune seem to be the favorite fruits, but as yet very little is planted, and most of the land is in large bodies awaiting subdivision, which will no doubt bring prosperity to the section.

The oldest orchard at this place was planted in 1855, and consisted of apples, peaches, plums, apricots, and pears. Among the old trees there is an apricot tree which measures 18 inches in diameter.

There are about 2,000 acres of fruit and about 900 acres of raisins in the county. The soil of the county as a whole varies from adobe and grayish soil to sandy loam. Land can be bought from \$25 to \$100 per acre, and is good fruit land.

Yolo County is also a large wheat county, and this industry overshadows all others. The orchards and vineyards are more numerous than in the preceding county, and continue to grow every year. Of the fruit industry, raisin growing takes the lead. This branch started at Winters, in 1869, with 240 acres, and the county has now about 7,000 acres planted.

The main fruit sections are the Capay Valley, which is about 25 miles long, and which has a fine stream of water (Cache Creek) running through it all the year; Putah Creek Valley, with Winters and Davisville, Woodland and vicinity, Yolo, Blacks Station, and Dunnigan, and along the Sacramento River from Knights Landing to the lower part of the valley.

In these sections the apricot, almond, peach, pear, and prune can be found growing and yielding abundant crops; also olives, figs, and oranges are harvested in the warmer locations. The principal market is the Eastern States, but large quantities of vegetables and fruits find their way to the San Francisco market. The crops this year were somewhat short; grapes yielded about half, apricots one quarter, and other fruits about a third of a crop. Although the crop was short, the growers are not complaining, as the market is good and prices are high.

The average prices of fruit this season were as follows: Apricots, 2 cents; almonds, 12 cents; peaches, 1½ to 1¾ cents; pears, 2 to 3 cents; plums, 1¼ cents; prunes, \$40 per ton, and \$17 50 per ton for shipping grapes, on the vines.

Capay Valley is a recently established fruit section, and is one where most of the early fruits are raised. Several colonies are in the valley, and the principal centers are Rumsey, Esparto, and Tancred. At Madison some fruits are also cultivated. This section has good shipping facilities, and a prospective road to Lake County is in progress. Irrigation can be carried on easily, as Cache Creek flows all the year round. Putah Creek and its valley is another fine fruit section, with Winters as the principal center. Here the fruit industry is in its highest development, and from this section the earliest fruits are shipped to outside markets. This district is noted as being a section where the date of commerce has matured.

At Woodland quite a number of extensive orchards are located, and large raisin vineyards help toward improving the surroundings, being at the same time very profitable to the owners. All along the Northern Railroad there are small places, such as Yolo, Blacks, and Dunnigan, where the fruit industry has started; also along the Sacramento River

from Knights Landing to the southern part of the valley are large areas of fruit, but all this fruit finds its way to the Sacramento canneries.

The oldest orchards were planted some thirty-five years ago, and a few healthy trees are still standing. These are apples, pears, plums, figs, and peaches. Some apple cions were introduced from Canada and grafted into seedling trees.

There are no canneries here, but some private individuals do a little drying.

Solano County is one of the principal fruit sections of the State. It is noted for its early fruits, which are the first seen in the Eastern markets, and have made a fame for the county. Hundreds of carloads of fresh fruit are shipped from different points every season, consisting of cherries, early peaches, and apricots, pears, plums, and grapes. All these fruits are packed with the utmost care, and particular attention is given to the method of packing.

In 1891, 814 cars of green fruit and 310 cars of dried fruit left Vacaville for the East; 250 cars of green fruit were shipped to San Francisco.

The principal sections where fruit is extensively grown are Vaca Valley (with Lagune and Pleasant Valleys adjoining) and Suisun Valley. Between Suisun and Davisville, in the Sacramento Valley, are some scattering sections at Elmira and Dixon.

The principal shipping points for Vaca Valley are Winters for the upper part, and Vacaville for the lower part of the valley.

The oldest orchards in this county are in Vaca Valley, and were planted by John R. Wolfskill. He came to the county in 1842, and settled on his grant of 4 leagues, situated on both sides of the Rio de Los Potos. He planted apricots, almonds, apples, pears, figs, peaches, olives, and sundry other fruits.

The principal fruits raised for profit are apricots, almonds, cherries, peaches, pears, plums, and table grapes. All deciduous fruits, and even oranges, grow side by side, but as this section is famed for its early fruits, they are most extensively grown.

Crops this year were somewhat light; apricots about one quarter, other fruits about one third, and about half a crop of grapes. Owing to good demand and high prices paid for fruit, the growers do not feel the shortage.

The prices for the different varieties were as follows: In the orchard—pears, \$50 per ton; peaches, from \$30 to \$50 per ton; cherries, 6 to 8 cents per pound; apricots, 1½ cents per pound. For Eastern shipments, at packing houses—pears, 65 cents to \$1 for 40-pound box; peaches, from 50 to 60 cents for 25-pound box; cherries, 78 to 90 cents for 10-pound box. A few quotations on dried fruit were: prunes, 10 cents; plums, 9 cents; apricots, 10 to 12½ cents; peaches, 12½ cents per pound.

The soil of the county varies very much. In the main Sacramento Valley the soil is black, very rich, possessing some slight indications of adobe. In Vaca Valley and elsewhere the soil is mostly a sandy loam. On the hills and mountain slopes there is considerable gravel and decomposed rock; in some places the soil is very shallow, bedrock being found close to the surface. In the lower part of the valley and along the river are large areas of swamp lands, some of which have already been reclaimed. These lands are mostly used for stock pasture and

dairy purposes, but a large portion of them are especially adapted to berries.

The price of land varies with location and quality, but the average price for unimproved land is about \$50, and for improved about \$250 per acre.

REPORT OF PROF. C. H. ALLEN, SPECIAL AGENT.

To the Secretary:

SIR: The counties assigned me were Alameda, Contra Costa, Monterey, Santa Clara, Santa Cruz, San Benito, and San Mateo.

I have visited all of them, and made as full an examination of the horticultural interests of these counties as the limited time at my disposal would allow.

In all places visited, the representative of the Board has been well received, and an eager interest has been expressed in the work being done, and, so far as it is known, I have found a keen appreciation of the work already accomplished. Aid has been cheerfully given me in every direction, and the desire expressed that the work now undertaken may be brought to successful completion.

The effort to ascertain the acreage of the different varieties of fruit will have one notably good result: it will, in a measure, compel growers to keep far more accurate records for their own guidance. I have been greatly surprised to find so large a number of intelligent growers who have only in a rough way a knowledge of their acreage or output. It need hardly be stated that everywhere the interest in horticulture is growing. Large areas formerly planted to hay and grain are being cut up into smaller places, and planted to fruit. The fact is being more and more recognized that intelligent industry is better rewarded in horticulture than in grain raising, or, if the land is adapted to it, than in stock raising.

The price of land is advancing, as its real value becomes better understood, and the change indicated above becomes, in a measure, imperative. On land valued at \$75 to \$100 per acre, one can hardly realize interest and taxes from a hay or a grain crop, while fruit, planted with any judgment and reasonably well cared for, gives invariably good returns. The fact that more and better care must be given to an orchard than to a grain field, tends to make smaller holdings, and consequently a more rapid development of the country.

To many who have engaged in fruit culture, the business was entirely new, and they have had to learn, step by step, as their orchards have developed. To such men the practical information distributed by your Board is of the greatest value. It would seem to me that an effort should be made to give the publications of the Board a much wider circulation. That these will be carefully read there is abundant evidence, for all growers are on the alert for useful information.

The counties which I have visited lie near the great commercial center, San Francisco, and comprise the greatest areas of fruit growing for the market. Here, also, are the largest and oldest orchards, save, perhaps, a few small orchards planted in the early mining times, for home markets. Yet even here but few orchards have reached anywhere near their maximum of production. If, in addition to this, it be taken into

consideration that every year new orchards are being planted, to come into bearing in the near future, one can but be amazed when he tries to estimate the production five or six years hence.

I have found few orchards going to decay. Some, indeed, from a lack of knowledge or judgment in planting, are unproductive; and some, for the same causes, are yielding nothing, as they are being "worked over," but there is absolutely no area going back to the old régime. In those localities where a few years ago many were discouraged and ready to give up the contest, because of the prevalence of predatory insects or other drawbacks, new life and vigor are apparent, and all look hopefully to the future. It is not an idle compliment to say that much of this change has been brought about through publications and agencies sent from your office.

There is now no doubt but that the fruit pests are being successfully coped with, and there is a well-grounded hope that many of them may be entirely exterminated. To this most desirable end several causes have contributed. Greater care is now exercised in the purchase of trees for planting. A nurseryman who should now send out infested trees, as was so widely done some years ago, would soon be shunned by all would-be purchasers. It is safe to assume that the trees now grown in the nurseries of this State are, in the main, clean. The quarantining of trees from outside, although it has begotten some ill feeling, and in some cases has been a real hardship, has undoubtedly been for the public good, and for this individuals must often suffer.

Growers themselves are becoming more expert, their eyes being trained to recognize easily the more common pests, and the battle, when waged in their incipency, is easily won. Cheap, easily prepared and easily applied, and in most cases effective remedies, are now so common that there is no excuse for maintaining an infested orchard. The woolly aphis has not yet succumbed, and the codlin moth we shall have "ever with us." But the former is so long resisted by well-grown and well-cultivated trees that its injurious effects are not very great; some orchards in the Pajaro Valley that have been infested for more than twenty years are yet bearing good crops of excellent apples. The codlin moth can be effectually held in check, and a clean yield secured, by the Paris green or London purple remedies. If it shall be fully proved, as is now probable, that for the woolly aphis there is a resistant stock, it will soon be used to replace the present apple orchards, and all apple and pear growers await with great anxiety the possible parasite that shall rid us of the codlin moth. The introduction of the *Vedalia cardinalis*, that has so effectually rid the citrus trees of the cottony cushion scale, leads growers to hope for important beneficial results from parasites recently imported and yet to be found.

One thing has particularly attracted my attention. Orchardists who have entered the business during the past few years have very decided advantages over the pioneers. They have, and make full use of, the facts that have been deduced and established by the experience of their predecessors. Some of these facts have been established at a fearful cost, but in a new industry this is usually the case.

Among the noticeable improvements the following are most observable: More care is exercised in determining the varieties to plant. Soil, exposure, and ease of handling the crop are all taken into consideration. A small expenditure in determining these things often saves the great

loss of time in making the tests, and of money in replanting or working over.

The stock upon which nursery trees is worked is found to be of great importance. Once a tree was a tree, without reference to its origin or nursery growth. Now buyers fight shy of trees on inferior stock, or trees that have been forced in the nursery by unnecessary irrigation.

Clean trees are insisted upon, and the expense of fighting pests is thus greatly reduced. This was the consideration that led to the rejection of so many imported trees. If this same care could be exercised in reference to small importations, by mail and otherwise, of trees and cions from the East and other countries, there would be a decided gain to California.

In planting deciduous trees, yearling trees or dormant buds are being selected, instead of trees two or more years old. The time was when yearling trees found no market. Experience has abundantly proved that the younger trees make not only the best orchards, but come into bearing quite as early.

The advantages of thorough and continuous cultivation are coming to be better and better understood. In many cases the substitution of the cultivator for the plow has proved both a saving of expense and a means of securing better final results.

In the matter of pruning, while a great diversity of opinion still exists, there has been great improvement. The relations between pruning for form and pruning for an immediate crop are better understood.

Add to all this the lessons that have been so expensively learned about handling the crop, and it will become apparent that the orchardist who begins now has an immense advantage over the man who began ten, or even five years ago. It would be unwise, however, to assume that there is not, even now, much to learn. The man who would succeed must ever be a constant learner from his own experience and from the experience of others.

Alameda County has some of the oldest and most celebrated orchards in the State. The almost fabulous yields of apricots and cherries in this county, with the amounts realized per acre for the fruit, gave the first vigorous impulse to fruit growing in California.

The Haywards district, comprising the plane from San Leandro to Sunol Cañon, lying so closely contiguous to San Francisco, was naturally the favorite region in which to grow fruit for the home market. All the land far enough from the coast to be somewhat sheltered from the raw coast winds, was found well adapted to fruit growing. The fact that abundant water was found, comparatively near the surface, made irrigation easy for small fruits. These were and are grown in large quantities and find a ready market. Large areas of currants, gooseberries, and other small fruits are producing, and are, in many cases, grown between the trees in the bearing orchards.

The most notable orchard is that of the Meek estate, consisting of nearly 1,000 acres. One hundred and fifty acres of this are cherries, more than 200 acres are apricots, 220 are almonds, 70 are pears, and more than 200 acres are prunes. In these orchards there are 140 acres of currants and 10 acres of blackberries. The output from this orchard has far outgrown the home market, and large shipments are now being made to the Eastern markets.

Through all this region the fruit goes either fresh or in cans, as the climate is not adapted to drying in the sun, and the cost of fuel is too great for profitable artificial drying. Many of the large canneries of the State depend upon the Alameda orchards for a considerable portion of their supply, and not a few of the inland packing houses transport from this locality fruit to dry.

It was years after fruit growing had become a leading industry in this locality before it was determined that the more easterly parts of the county were adapted to fruit. At Mission San José there were some orchards, the offspring of the old Mission, and a large almond orchard had long been in profitable bearing there, but it was doubted whether in the drier part—the Livermore Valley—fruit could be grown without irrigation. Grapes were planted, and succeeded beyond expectation, and gradually tree planting has made its way until at Niles, at Centerville, and beyond the Sunol Cañon, in Sunol, Pleasanton, and Livermore, there are excellent orchards. Most of them are yet young, but they bid fair to compete favorably with the fruit belt in the Santa Clara Valley. Most of the orchards are in the low lands. They have yet to learn that the foothill land is equally adapted to fruit culture, and that culture can take the place of irrigation. The fruit area here is surely destined, in the near future, to be greatly increased.

At Niles is one of the largest, if not the largest, nursery in the State. The California Nursery Company, with a capital of \$100,000, has about 500 acres in nursery stock, consisting of fruit trees, vines, and ornamental trees and shrubs. Their sales in 1891 were about 750,000 fruit trees and 200,000 ornamental trees and shrubs.

The orchards in this county seem to be well kept, fruit pests being absent or well in hand, and there is on every hand evidence of prosperity.

Contra Costa County, until within a few years, has had little claim to be considered a fruit-growing county. The orchard and vineyard of the late Dr. Strenzel, near Martinez, in a little nook which he named "Alhambra," have been long known for the variety and excellence of the fruit produced. Sixteen years ago the writer saw oranges, figs, and olives thriving there, and the grape product was then, as it is now, of excellent quality and immense in quantity. A few scattering orchards were planted in other localities, but the real advance in horticulture is of comparatively recent origin.

Upon the west the county is washed by the waters of San Francisco Bay, and this region is fully exposed to the winds coming in through the Golden Gate, lying just opposite. Along this exposed portion of the county the conditions are not favorable to fruit growing, but from Martinez, which is in a measure protected, south, up Walnut Creek, there is excellent orchard land, but little of which has yet been planted. The semi-coast exposure gives conditions favorable to apples and pears, and farther inland almonds do exceptionally well, while apricots, prunes, and, upon some exposures, peaches and nectarines give good returns.

From its peculiar situation, and its excellent soil, Contra Costa County can produce as great a variety of fruit as any county in the State; indeed, there are few counties that can equal it. Most of the orchards are yet small, but those of Mr. Hemme, Mr. Bancroft, and some others, will take the front rank when compared with orchards in any locality.

Nut growing here is attracting considerable attention, many acres of almonds, walnuts, and pecans having been planted. All seem to promise well. The same is true with regard to olives, there being several large plantings.

The most of the fruit from this county is marketed fresh, the conditions, except in the interior or eastern part, not being favorable to drying. Large shipments are made to the Eastern and northern markets, and so excellent is the product that a good market is always readily found.

Monterey is emphatically a coast county. Fully open at the north, through the formation of Monterey Bay, to the coast and trade winds, it has, even far down the Salinas Valley, a coast climate. A very large portion of the entire area of this county is made up of the different spurs of the Coast Range, and the foothill lands adjoining.

The wide, level stretch of land on the northwest, including the Pajaro and Upper Salinas Valleys, has a deep, black, and very moist soil, and all, or nearly all, of it is admirably adapted to apple growing. Here are found the largest and oldest orchards in the county, mostly apples, and the output is of most excellent quality, and in amount is something surprising. The first orchards here were planted as early as 1856-7, when John Clifton and George N. Graves planted apple trees, many of which are now in bearing. In 1858 W. S. Johnson planted an orchard of assorted varieties; many of the apples, pears, and apricot trees are yet yielding good crops.

The principal fruit districts are around Pajaro, San Miguel, Carmelo, and Salinas. There are, however, small orchards far down the valley of the Salinas River, at Gonzales, Soledad, Kings City, San Lucas, and perhaps farther south.

In the interior valley, apricots, peaches, and pears produce large crops of excellent fruit, and in the valley land and the adjoining foothills, fruit growing must take the place of stock raising. In the southern part of the Salinas Valley fruit can be dried in the sun, and the prune should be grown with great profit.

With the exception of the woolly aphid upon the apple, this county is nearly free from pests, and can easily be kept so if growers will be watchful. I found here much interest in the work being done by the State Board of Horticulture, and I can well believe that the horticulturist here will avoid many of the costly mistakes that his brother in the older fruit-growing districts has committed.

San Benito County, from its formation and location, must remain chiefly a grazing county. While the great central valley with its offshoots is, at least in the northern part, adapted to fruit, the great hill or mountain areas will not for years, if ever, be a fruit region.

Around Hollister and San Juan there are some excellent orchards, and the interest being manifested promises an early and large increase in the area. The valley is well protected from coast winds, and the climate seems to be almost perfectly adapted to the growth of the apricot, the peach, and the nectarine. Nowhere have I seen the apricot in greater perfection. The few orchards first planted were all apples, and on the moist ground, or where the trees can have irrigation, they make a good crop. Almonds, olives, and figs ought also to thrive here.

Most of the plantings are new and the growers new to the business, and yet the results already attained give good promise for the future.

The old Mission orchard at San Juan is exceedingly interesting. Something more than 50 old pear trees are standing, towering aloft from 30 to 40 feet, sometimes 12 or 15 feet to the lower limbs. The father in charge expressed the condition well, when he said: "They did not understand how to grow fruit then, as they do now." The trees are scattered around miscellaneously, with little reference to rows or distance, but most of them well laden with fruit.

Years ago wagon loads of pears were hauled from here to Alviso and shipped to the San Francisco market. The trees are mostly seedlings, but some of the fruit seemed of good quality. Grafted trees must have been introduced, or made here, very early, as near the Mission orchard I saw Duchess pear trees 40 feet high. A half dozen old olive trees are standing, but have received little care, and are not now fruitful.

The acreage in this county is small, and there has not yet been found the need of canneries or large drying grounds. The conditions are so favorable to drying that these will surely come, and prove successful.

Large grain tracts in the valley are being cut up to sell for orchards. These should be in immediate demand, as boom prices have not reached this county.

San Mateo County, situated on a peninsula formed by the San Francisco Bay, has a distinctively coast climate. There are comparatively few orchards in this county, but in some favored localities in the eastern part of the county fruits do exceptionally well. Even the apricot, generally so easily injured by coast winds, perfects well in and around San Mateo.

On the coast side there are good apple orchards, all the conditions being favorable, where somewhat cut off from the stronger winds.

But little fruit is grown in the county for the outside market, and not many new orchards are being planted. There are good localities for prunes, where they should produce well, but few have, however, been planted. Considerable attention has been given in some localities to table grapes, some quite large vineyards having been planted, particularly around Woodside.

The orchard, nursery, and flower farm of Timothy Hopkins, at San Mateo, is the most celebrated, both for the excellent fruit produced and for the large area, about 50 acres, in flowers.

There are two or three other places where cut flowers are largely grown for the San Francisco market.

There are fine localities here adapted to small fruits, and I am surprised that, accessible as it is to the market, more are not grown. When the great lumber supply shall have become exhausted, fruit growing will attract more attention.

Santa Clara Valley seems to have been prepared by nature to become what it claims to be, the banner deciduous fruit area of California. The great Santa Clara Valley, lying between the Santa Cruz range on the west and the Mt. Hamilton range on the east, with its immense acreage, is all, or nearly all, adapted to fruit. The low, wet lands in the extreme north, around Alviso and Milpitas, are the only parts of the valley where the orchardist may not plant with the certainty

of receiving good results, and even here small fruits are grown with great profit.

Far enough from the coast to be protected from the raw ocean winds, and yet open toward the north to the San Francisco Bay, which exercises its equalizing influence upon both its winter and summer climate, it has a wide range of horticultural possibilities. No county can show a wider range of products of equal excellence; and rapidly as other parts of the State are being developed, it will be long before the palm of superiority will pass from Santa Clara County, even if it shall ever do so.

So great is the fruit area of the county that two full weeks devoted to the work of inspection were altogether too short to make anything like a thorough examination. With San José as its center, and in a radius of 6 miles, a circle described would inclose almost a solid fruit area, a small section on the north excluded. This circle contains more than 70,000 acres. Add to this the Mayfield and Mountain View districts on the northwest, and the Los Gatos and Saratoga districts on the west, the Coyote, Madrone, and Gilroy districts on the south, all of which are or are becoming fruit centers, and a slight conception can be formed of the fruit acreage of the county. One no longer wonders that the output in 1891 was more than 2,000,000 pounds of canned goods and 24,000,000 pounds of dried fruit, more than 22,000,000 being prunes. The shipment of fresh fruits reached an enormous amount. This, it must be understood, covers only shipments in carload lots; shipments of less quantities being kept by the railroad companies as merchandise. It is instructive to know that from one small station, Wrights, in the Santa Cruz Mountains, more than 500 tons were shipped during the year in less than carload lots.

At the time I visited the orchards, cherries had been marketed, and apricots and peaches were on. The driers and canneries were busy handling the crop, which, though far less than the average, was large enough to demand their full capacity.

I found no abatement in horticultural interest. The very small prices that ruled last year, while somewhat discouraging, did very little towards checking the planting of new orchards. Those already planted are well cared for, and the various horticultural or fruit associations do much in the way of disseminating practical knowledge.

As Santa Clara County has taken the lead in the matter of fruit shipments, so is she taking the lead in forming coöperative organizations for handling the fruit when ready for market. So far these organizations have been productive of great good, and with the wisdom derived from experience, more good will result in coming years.

Canneries and fruit-drying establishments abound, especially the latter. It takes a very large plant to handle the fruit from even a square mile of orchard. Large numbers of growers dry their own fruit, and all are becoming skilled in turning out good fruit.

Around Santa Clara, Lawrence, and Mountain View are the large seed farms, a feature of the county. About 2,000 acres here are devoted to raising garden seeds, and although this is not, perhaps, strictly horticultural, as the term is generally understood, yet the industry is worthy of note.

The most notable orchards I visited were those of Mr. A. Block, at Santa Clara, and of Mr. Miller, at Gilroy. Mr. Block's pear orchard is largely of dwarf pear trees, planted 6 to 8 feet apart, and it was a

singular sight, these small trees, laden, in many cases, with most excellent fruit. Planted in this way, good crops can be secured only by fertilization and irrigation, the secret of both of which Mr. Block seems to have mastered.

Mr. Miller's orchard is one of the most promising I have ever seen. Intelligence and skill have been used in selecting varieties, in planting and in caring for the trees; and these will both reappear in the future product. Indeed, they even now abundantly show themselves in trees well laden with choice fruit.

Outside of the Mission orchards, the first fruit trees planted in the county were brought here by a man by the name of Ganz, the trees having been brought from Cincinnati, Ohio, in 1852-3. Le Valle also brought trees at about the same time. I am informed that the apple trees then imported were infested by woolly aphis. These trees were distributed to Joseph Aram, E. W. Case, William Daniels, R. G. Moody, and perhaps a few others. They were mostly apple trees, though there were a few pears, plums, and peaches. Many of the labels were lost, and other varieties were purposely misnamed, as is now not infrequently done, to secure a market. Among the apples true to name were the Rhode Island Greening, the Canada Renet, the Baldwin, Esopus Spitzenberg, Early Harvest, Smith's Cider, and the Yellow Bellflower. In the matter of names, it became common to give merely local names, some of which seem to have been so persistent as to have nearly driven out the true name. As an example of this is the Napoleon Bigarreau cherry, which became the Royal Ann, a name now widely used.

Grafting was done in a crude way by the old Spanish women, who had learned the art around the Missions, and varieties soon became disseminated.

Fruit planting is not at an end in Santa Clara County. Large orchards are being planted each year. When all the orchards have reached their maximum of production the problems of handling and marketing the product will require the wisdom of the best minds for their solution.

The County of Santa Cruz, while containing some of the oldest productive orchards in the State, has become a fruit-growing county only within the past few years. Being a coast county the extreme western limits are too much exposed for successful fruit growing. The climate, except at elevated points on the Coast Range, above the fog, is not adapted to drying, but is well adapted to the growth of apples, pears, and plums, which must be marketed fresh. Where prunes are grown they must be dried by artificial means, or shipped inland for drying. Fuel is so abundant that artificial drying is, in a few cases, being resorted to.

Around Watsonville, in the Pajaro Valley, the low, moist lands are peculiarly adapted to small fruits. There are here about 400 acres of strawberries, 140 acres of blackberries, and 140 acres of raspberries, besides many small lots not enumerated. These are disposed of in the San Francisco market and to the several canneries. Here, also, are extensive apple orchards, the fruit from which is usually sold in bulk to packers, who ship it to distant points for a market. The large drier erected by the Beck Bros. will foster the planting of drying fruits in this locality. Prunes upon the foothill land must do well.

Here is one of the oldest nurseries in this part of the State. It was

established in 1866, near the town of Watsonville. Five acres were planted in trees the first year, mostly apples, though there was a small general assortment. But little stock could be grown here, as it was difficult to get seed, and much stock had to come from the East or from France, via the Isthmus, a long tedious trip through a tropical climate. Many of the importations were seriously injured or entirely lost. It was exceedingly difficult to get buds and cions true to name.

All trees had to be two years old, as no one would buy yearling trees. Prices were good: apples, \$30 per hundred; pears, cherries, and plums, \$50; peaches, \$40; while Monterey and Italian cypress and pines sold at \$1 each. Mr. Waters yet continues the business, having 65 acres closely planted in nursery trees. They are almost exclusively fruit trees.

Mr. Blackburn showed me a bill of trees from the Suscol Nurseries, in Napa County, dated 1857. Here prices range from 37½ cents to \$1 per tree, the bill for a small orchard amounting to over \$150. These trees were planted in Blackburn Gulch, east of Santa Cruz, and many of them are yet fruitful. I found a few cherry trees in Santa Cruz, large and thriving, which were planted by Mr. Cooper thirty years ago.

At Soquel there are some productive orchards, cherries doing finely. In Blackburn Gulch grapes have been widely planted, but there are some very good orchards. The rocky slopes are best adapted to grapes, but the deep soil will grow good apples, pears, apricots, peaches, or prunes. The conditions are not favorable to drying. The orchard and vineyard of Mr. Galbraith show clearly what intelligent industry will accomplish.

I was not able to visit the Ben Lomond district, but from what I learned from Mr. Cooper and others, am satisfied that it is an excellent fruit region.

Perhaps the largest and most productive orchards in the county are to be found in the "Skyland" region, near the summit of the Santa Cruz range. Here prunes are the favorite product, and the crop, in quantity and quality, will compare favorably with that of any part of the State.

In this county the olive has attracted considerable attention, and the interest created by Judge Logan has resulted in the planting of many acres, soon to come into bearing. The rocky hills, seemingly adapted to nothing else, will grow olives to perfection.

In closing my report I desire to express my thanks to those who have so cheerfully aided me in the work I have attempted to do.

REPORT OF R. H. HEWITT, SPECIAL AGENT.

To the Secretary:

SIR: The counties assigned to me were Los Angeles, Orange, San Diego, San Bernardino, Ventura, Santa Barbara, Kern, and San Luis Obispo, for the purpose of making an examination of the fruit-growing industry, its present condition and future outlook, as revealed in the territory named. In conformity to your instructions I made the necessary investigation, and herewith submit my report.

The area noted in this district may be distinctly described and entitled under what is generally known as Southern California, excepting

singular sight, these small trees, laden, in many cases, with most excellent fruit. Planted in this way, good crops can be secured only by fertilization and irrigation, the secret of both of which Mr. Block seems to have mastered.

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The area noted in this district may be distinctly described and entitled under what is generally known as Southern California, excepting

the county of Kern, segregated by the Tehachapi Mountains, the northern portion of Santa Barbara County, effectually barred by a chain of mountains, and the county of San Luis Obispo. If one wishes to comprehend the scope of this domain a little study of a good map of the State will afford considerable information. Included in this district are the vast areas known as the Mohave Desert, covering a great portion of Kern and San Bernardino Counties, and the Colorado Desert, covering the eastern portion of San Diego County, the western basin of the Colorado River, embracing something like 2,000,000 acres. The terror that these uncanny localities once inspired has now well nigh passed away, as the fruit grower, in his hunt for other places and more room, and the rancher, have subdued a great amount of this waste country, and have caused the fruit trees to blossom and bring forth, and grain to grow luxuriantly. In proof of this, witness the success attending the industry in Antelope Valley and its immediate neighbors in the Mohave Desert, and the progress made in Palm Springs Valley and around Indio, on the Colorado. The salt industry at Salton Station, on the desert, is a recent development, and while not exactly horticultural, has a certain "preserving" quality.

Under the impetus given by the construction of the Sweetwater Dam by the San Diego Land and Town Company, with its vast network of irrigating pipe-lines extending over a great portion of the lower or southern end of San Diego County, fruit raising has assumed a new phase, and is now a recognized factor in the prosperity of that county. The Sweetwater Dam, erected in 1885-87, at a cost of about \$736,837, including distribution service, marked a new era in the advancement of that county, and is a grand monument to its projectors; it converted dry, barren, and unproductive lands into some of the most valuable in the State, lands which a few years before were hardly thought worthy a visit even by jack rabbits. The men who devised the enterprise thought otherwise, and the result justifies their faith. About 15,000 acres of land are now under this system, and the area for irrigation can be extended by several thousand acres.

The land for the most part is a red clay loam, and when once broken up is ever after easily worked, and clear of gravel and boulders, strong and rich.

The Chula Vista mesa, about 7 miles south of National City, is a thriving locality. The land holdings are from 10 acres upwards, but largely of 10 acres, and every land owner planted his lot with fruit trees, and several hundred acres now show the result of industry and intelligence. Land under the pipe-lines is held at from \$400 to \$700 per acre; very little is sold below the \$400 figure. Water for irrigation costs \$3 50 per acre per annum, and \$10 for domestic use.

Apples, pears, peaches, apricots, etc., do well here, and oranges are grown to some extent, but this mesa and an immense strip adjoining north, is preëminently the home of the lemon, and many thousand lemon trees have been planted within the last three or four years, and planting still goes on unabated. Walnut and olive trees are also being planted; but the lemon in this end of the county leads all combined. The guava is represented by 35,000 plants.

Many of these orchards came into bearing this year, and the interesting question now attracting attention is the curing and shipping. The experience and long years of anxious labor of others will greatly

simplify this problem. But little trouble is experienced from insect pests so far; all the orchards are clean and well cultivated. There are about 2,500 acres planted in this section.

South Cholas is also making a good showing in this line, so is Monument and Otay and other places down to the Mexican border; but they are retarded for want of water.

Sweetwater Valley is somewhat limited, but profitable use is being made of nearly all of it capable of cultivation. Orange, lemon, apple, fig, peach, and prune do excellently here. The peaches and apricots from here largely supplied the local market this year, and were of a quality unexcelled.

National City, on San Diego Bay, became known everywhere through the indefatigable labors and intelligent judgment of Hon. Frank A. Kimball and his brother Warren C. Kimball. These gentlemen planted large olive orchards, and for many years the products of these orchards, in olive oil and olives prepared for table use, have been sought for in quantities far beyond their ability to supply. They are the pioneers of the olive industry in this county, and their reputation is well sustained. These gentlemen are also extensively interested in orange and lemon growing. They have 65 acres in olives: Frank A., 40 acres, and Warren C., 25 acres. The olive oil manufactured by Hon. Frank A. Kimball is known all over the country. Last year he produced 1,460 gallons. Ripe olives sufficient to have increased the product of olive oil to 3,000 gallons were turned into pickles.

The cultivation of the olive is also attracting the attention of others, and around National City are many thriving young orchards, as also numerous orchards of lemon and orange, and a variety of deciduous trees. Guavas, to a considerable extent, are grown, and manufactured into jelly.

This place is also under the Sweetwater system for irrigation and domestic use. The amount of water supplied is ample, and has a pressure at this point sufficient to obviate the necessity of fire engines in the city.

Around San Diego City many are turning their attention to fruit culture. Pacific Beach and Lawson Valley will soon be in the market, as a considerable acreage has been planted to a variety of fruits this year. Lemon and orange planting is still going on. Lawson Valley contains now over 15,000 trees two and three years old.

El Cajon Valley, a combination of valley, mesa, and hill slopes, is 12 miles from San Diego, eastward. It was originally a Spanish grant, comprising about 48,000 acres. The valley is connected with San Diego by the Cuyamaca Railroad. A very great extent of this valley is under splendid cultivation, and in it are homes of very many people of wealth who settled there and commenced to demonstrate what the soil would produce. Oranges, lemons, prunes, almonds, and all deciduous fruits do well and bear profitably. The El Cajon Valley is now the raisin district of this part of the State, and a superior quality is produced. In August of the present year a large portion of the last crop was on hand, prices offered not being deemed satisfactory. This section is irrigated by water from the San Diego Flume Company's flume.

Lakeside, farther up the valley, is showing up finely. The plant of 1892, by acres, in citrus fruits was as follows, in the localities named: Lakeside: oranges, 22; lemon, 24; La Mesa: oranges, 6; lemon, 17;

Lemon Grove: oranges, 68; lemon, 57; Pacific Beach: lemon, 120; oranges, 40. Santee makes a good showing, especially in peaches and raisins.

The country around Oceanside, Escondido, San Luis Rey, and the settlements in the vicinity of each, show the same progress noted elsewhere; especially is this the case about Escondido. When irrigation facilities are extended it will tell distinctly in these sections.

The San Diego County Flume Company, a private corporation, erected its flume in 1887-88, at a cost of \$959,789, including land for reservoirs, and exclusive of iron pipe-line, 10 miles long, costing \$65,000. It supplies the city of San Diego, and is also used for irrigation. A very considerable area of irrigable land under this flume has not yet been brought under cultivation.

The country about Fallbrook, DuLuz, and Valecitos is not as accessible now as formerly for a hurried trip, owing to the destruction of the railroad through the Temecula Cañon.

Elsinore, Wildomar, Murietta, and Temecula were found to be more than holding their own. The increased acreage of fruit shows industry and confidence in the future.

Palm Springs Valley, at the foot of Mount San Jacinto, on the Colorado Desert, was a remarkable place for men to go, but Wellwood Murray and a few others discovered the little nook and found out that it was not all desert. There are now 385 acres under cultivation in fruit. The situation makes one forget that the desert was once so near. They find a ready sale for figs, grapes, and apricots, the first in the market in Los Angeles and San Francisco. They have here the Palm Valley Water Company, organized in 1887. Their source of supply is the Whitewater River in the San Bernardino Mountains, conveyed in a cement ditch, 10 miles long, and canals, 14 miles long, carrying a volume of 1,000 inches of water.

In the valley around Perris, an elevated plateau, extending from the foot of the San Jacinto Mountains westward, the transformation is more marked than is elsewhere noticeable. From a sheep and cattle range of a few short years ago, of indifferent condition and slight value, it has moved out as a fruit-producing region. The development and distribution of water are working the change. The soil is strong and gives good return for attention paid to it. Orchards dot the great plain in many places and give good indications of future wealth; but they are generally too young as yet to make much showing in the markets. At Winchester, F. F. Lindemburger and R. C. Brinkenhoff have fine olive orchards, and the Messrs. Kirkpatrick have a vigorously growing vineyard. At Manifee, William Wrumpremeyer has an extensive prune orchard, and Dr. Stephens' prune orchard at Perris is in apparent good condition, and both give good promise. Table grapes, apples, apricots, peaches, pears, and other fruits do exceedingly well and are measurably free from scale and insect pests. Artesian wells are numerous, but there will be little reliance on this uncertain source for irrigation in the lower valley.

San Jacinto Valley is a beautiful place, and is the home of many prosperous farmers and fruit growers. A branch of the California Southern Railroad (Santa Fe system) reaches to the town of the same name, and affords transportation for all products. In the district composed of San Jacinto, Florida, Diamond, Winchester, Manifee, and Perris, there are trees in orchard as follows: Orange, 3,700; lemon, 8,463;

apple, 4,700; peach, 7,302; pear, 9,432; plum, 2,964; prune, 2,300; apricot, 9,472; walnut, 1,446; almond, 98; olive, 4,086; fig, 2,100; also 160 acres of grapes.

The irrigation facilities for this region may be summed up as follows:

San Jacinto Irrigation Company: Water from San Jacinto River and mountains, and between 300 and 350 artesian wells, ranging in depth from 100 to 350 feet, costing from \$100 to \$500. Average flow, 5 inches.

San Jacinto and Pleasant Valley Irrigation District: Organized in 1891. Number of acres in the district, 19,000; value of bonds voted, \$350,000; value of bonds sold, \$158,000, at 90 cents and \$1; value of water, \$158,000. Source of water supply in San Jacinto River and tributaries.

Lake Hemet Land and Water Company, in San Jacinto Valley, getting its water supply from the San Jacinto Mountains, is constructing an immense reservoir at a cost of \$1,500,000. The company has 10,000 acres to irrigate.

Another irrigation district has been formed in the valley around Perris, under the Wright Act. The bonds for \$300,000 are being placed for the same. This new district will include the San Jacinto Water Company and the Florida Water Company, including, when complete, fully 35,000 acres under water.

Other organized water districts are getting ready for operation, as follows:

Jamaica Irrigating District: Organized February, 1892, with 22,000 acres, and a bonded valuation of \$750,000. Organized under the Wright law. Source of supply, Cottonwood River, 3,000 inches.

Otay Irrigation District was partially organized under the Wright law in 1891, but is still incomplete. Number of acres in the district, 43,000.

It is worthy of more than passing note that all over this county every cañon and nook large enough to offer a harbor is occupied by people making a home, and their first move is to plant fruit trees. There is a certainty of a good yield of fruit; much else is uncertain.

The system of conducting and distributing the water from the Sweetwater reservoir is thorough and complete in every way, its value being fully understood. The pipes are made of cement and iron; no open conduits are used until the water reaches the place to be irrigated, and is then discharged into an open flume, to be conducted to the place needed in the orchard. By this means there is absolutely no waste, either by seepage or evaporation.

Very little fertilizing is done, except in a few localities; sheep and stable manure is used chiefly, also fish guano.

There are no canning or fruit-drying establishments in the county, each producer either shipping the fruit green or drying it himself.

The fruit interests in *Orange County* are looking at this time much more encouraging than ever before. Various causes contribute to this—a more expanded market, better prices for fruit, dried and green, and the increased attention paid to its production. The prostration which prevailed in this section a few years ago, when a mysterious vine disease ruined every vineyard and pretty nearly resulted in the same way with their owners throughout the county, and when the prolific scale bug and nearly every species of scale invaded tree, vine, and shrub, has about

run its course, and the conditions are being reversed. The scale bug has disappeared under judicious treatment, and things are looking bright once more.

The raisin vineyards have comparatively all succumbed to this unknown disease, and the withered vines have been removed; but in numerous places they have been replaced by fruit trees, and the county now contains an enormous acreage, both citrus and deciduous. There are still, however, about 1,000 acres of raisin grapes, and a number of acres have been newly planted. They all promise well at present.

Orange is a compact little county of about twenty-one townships, is generally level, and her people take pardonable pride in their county relations.

Anaheim was the slowest to recover, perhaps, as around this section was the greatest expanse of vineyard, largely of wine grapes. But the fruit tree is there to stay and it is coming well to the front. Around Anaheim, Garden Grove, Centralia, Westminster, Buena Park, Orange-thorp, Placentia, Yorba, and Olive, there are something over 4,000 acres in fruit and nuts; at El Modena, 1,700 acres; Fullerton, 2,000 acres; Capistrano, 540 acres.

Orange looks bright and cheerful and her people are paying careful attention to her many small, and a few large orchards. There are here about 900 acres in fruits and nuts, and 125 acres in table grapes. About 500 acres of raisin grapes were planted the present year, and promise well. Walnuts and oranges take the lead, as indeed they do all over the county. Mr. Hughes' 100 acres of prunes are a treasure.

Santa Ana is in the midst of a very fertile valley, and is, withal, rejoicing in a degree of prosperity more attributable to fruit growing than agriculture. The shock of the ruin of vineyards was a staggering blow, but the orange, apricot, peach, and walnut have left their impress.

Tustin City is in good trim, and her orchards well cared for; trees well fruited. Every owner is doing his best to eradicate all signs of insect pests. For various reasons the fruit shipments were not up to the usual amount, but prices averaged well.

There are no canneries in operation in the county. Most of the fruit is dried, and largely sold to Eastern dealers. Packing houses closed, as orange season is over.

The owners of the great San Joaquin ranch have determined upon a plan for irrigating the greater portion of their possessions, and are about to commence work on a reservoir and necessary irrigating canals, intending this for a new fruit section.

The Anaheim Union Water Company furnishes water for irrigating a great portion of the territory named above. It was organized February, 1884, with 6,885 shares, based on an estimate of one share per acre.

The Anaheim Irrigation District was organized under the Wright law, in 1880, the district embracing 32,500 acres. Bonds amounting to \$600,000 not yet sold.

A visit to nearly all the fruit sections of *San Bernardino County* clearly revealed the great interest everywhere taken in fruit culture, especially in the orange. The almost certain profit to the grower has stimulated the industry to a wonderful degree, and the area in orange trees is numbered now by the square mile, and is constantly increasing. It may be said that the whole of the great valley which forms the western portion of

this county, and which has been so productive and valuable that its fame is known all over the world, has secured its standing by irrigation alone, and that within a very recent period.

Deciduous fruits do excellently, and are grown in great abundance. The same may also be said of raisins; but the great industry which claims the attention of all is the profitable one of orange growing.

The crop of deciduous fruits was not up to expectations the present year, but the outlook for oranges and lemons was never better, and barring any unforeseen accident which would work an injury, the output will test the railway companies to move it. The market for San Bernardino oranges is found in every large city in the East.

The first orange trees planted in the county were at Old San Bernardino, by Anson Van Leuven, early in the sixties, and were seedlings. While excellent in quality, the trees required many years to mature. The Navel has taken its place, and is not only a delicious fruit, but is a free bearer and fruits young. At the time of my visit there were nearly 37,000 acres of orange trees in the county, of which about 3,000 acres are the plant of 1892, and planting was still going on.

South Riverside is a new locality, but is making rapid strides forward, a large acreage of lemons being planted here. Arlington, a suburb of Riverside, is a wonderful example of energy directed in orange planting. It is exceedingly difficult to ascertain the names of growers in this locality, owning from 5 to 50 acres each, mostly of recent planting. Good authority insists that fully 250 owners are alien to the county, most of whom do not reside in the United States.

The orange growers of Riverside look with calm confidence to the future, and are content with their surroundings, for all the gold and silver mines of the world will not henceforth produce the wealth secured from these splendid orange groves. The names of owners of orange tracts are legion, who own tracts of from 10 to 100 acres. It is a matter of three months' time for one to undertake a visit to each orchard in San Bernardino County.

Frost and wind did serious damage to the orange orchards in the county in the early part of the season, and lessened the shipments greatly. But no one appears to think this will occur again very soon, and planting goes on more rapidly than ever.

The unknown grape disease did not, to any extent, affect raisin grapes in this vicinity, and the product of 5,000 acres of vines finds a ready market at home.

Some idea may be formed of the value of land for orange culture, when it is stated that land along the water ditches is held at from \$350 to \$450 per acre, and when planted one year sells for \$700 per acre.

The lemon is not planted so generally as in San Diego County, but still it has a good footing, and Mr. Geo. W. Garcelon, of Riverside, has worked intelligently and patiently in perfecting a way to care for and cure the lemon, and he now has the satisfaction of realizing that his work was well done, and an entire success. His cured lemons, seven months from the tree, find ready sale at his door at \$5 per box.

The growth of orange culture in eleven years may be illustrated in figures, which carry with them a valuable object lesson, thus: In 1880-81 there were shipped from Riverside 15 carloads; in 1891-92 there were shipped from the same station 1,416 carloads, or 405,590 boxes. But for the damage by unfavorable weather, above referred to, there would have

been quite 2,500 cars, the calculation based on the number of trees in bearing. A report following this will record 3,000 cars shipped. From the same station were also shipped 225,000 boxes of raisins. The shipments of other green and dried fruits, added to the raisin and oranges, sold in the markets for \$1,500,000. In 1876 Riverside was hardly known outside of a 100-mile circle.

Redlands is called in cant phrase the "infant wonder," and one does wonder at the great strides the young city has taken, but very soon understands the reason when a glance is taken at the magnificent fruit orchards around the place; there is nothing else growing of value. Horticulture is an art in this locality, and pays many fold for all the outlay in labor and water. Five years before the date of the printing of this report not a building stood where are now large business blocks in Redlands. It is located 9 miles east of San Bernardino, up the slope of the mountains, and from any point of observation one can look over a valley below and around of more than 1,000,000 acres in extent, dotted here and there with settlements, surrounded by orchards. Nearly every acre of this vast domain is capable of cultivation and fruit growing. It is in its infancy.

Redlands shipped 186 carloads of oranges this year, about 5 per cent of the trees only in bearing—Navels, Malta Bloods, and Mediterranean Sweet.

The city embraces 17½ square miles. Peaches, apricots, and pears were largely shipped, some East, the remainder to the San Bernardino canning factory. Some were dried and sold at prices ranging from 8 to 11 cents. Over 1,000 acres of citrus fruits were planted at the time these notes were made, and planting was still in progress.

Redlands, including Lugonia, has something more than 5,000 acres in fruit; over 2,000 of this acreage are in oranges. Lemons do not make as good showing as the orange.

At Highlands are a few of the best orchards that can be found anywhere. Crafton, Beaumont, Banning, Mentone, Alessandro, the valley at El Casco, Warm Springs, Idlewild, and Moreno make good showing of all kinds of fruits, and make report of increased acreage, and are in favored locations.

Colton shows upwards of 2,000 acres of fruit trees to her credit, with the same story of constant increase. The orchards about San Bernardino are mostly back to the foothills, or noted in the report of adjacent districts. Around Arrowhead the places are mostly new and uniformly good. Messrs. Little & Avery have in the vicinity 16 acres of lemons and 150 of oranges, young, thrifty trees. These gentlemen have 16 artesian wells, springs, and 10 inches of water, from East Twin Creek, and the privilege of purchasing water from the Bear Valley mains, which cross their premises. The wells are 7 inches in diameter, and from 100 to 200 feet deep, and irrigate 200 acres.

Chino is not essentially a fruit-growing district, though having an area of 700 acres of mixed fruits. This is the sugar beet district and the location of the Chino Beet Sugar Factory. The acreage of fruit will be considerably advanced during the next planting season.

Rialto has 1,000 acres in fruit, about one third of this having been planted this year. The deciduous trees did fairly, but the oranges are not in bearing.

About Etiwanda there are also about 1,000 acres in fruit, exclusive of

grapes. Here the fruit crop is light; grapes average. The product of 1891 was: Raisins, 545 tons; oranges, 1,065 boxes; lemons, 185 boxes; apricots, dried, 18,200 pounds; peaches, dried, 2,900 pounds; prunes, 500 pounds; wine grapes, 300 tons. Cucamonga and Mount Vernon districts have also about 3,000 acres of fruit trees, and upward of 2,000 of vines, principally wine grapes.

Ontario has an area of about 3,600 acres of fruit trees, and 300 of grapes. The word "about" is used, as any attempt at accurate statistics in July and August, when citrus tree planting is at high mark, is very uncertain. The orchards all look fine and receive excellent care. The crop of 1890 was the first to be shipped from the city, the trees being mostly young, but the showing is as follows, by carloads: Oranges and lemons, 21; green fruit, 21; dried fruit, 17; raisins, 12. In Ontario and North Ontario there is in fruit about 5,000 acres.

Irrigation around Ontario is from water furnished by the Ontario Land and Improvement Company, which irrigates 4,000 acres. The source of supply is San Antonio Cañon stream and a tunnel, which supply a volume of 750 inches of water. The water is distributed in cement and vitrified pipes. No open ditches or flumes are used.

The Semi-Tropic Water Company, at Rialto, has a canal 7 miles in length, which carries 2,000 inches of water. A private corporation.

Rialto Irrigation District, organized under the Wright law, in 1891, covers an area of 7,200 acres. Bonds were issued in 1891 for \$500,000. The Citrus Belt Irrigation District, organized in 1891, under the Wright law, includes an area of 12,000 acres; bonds, \$800,000. Etiwanda Water Company, formed for appropriation of water. Four and one half miles of V flume, carrying about 400 inches of water, distributed in 17 miles of cement pipe. Shares, one inch to 8 acres. Alessandro Irrigating District, organized January 3, 1891, under the Wright Act, has 25,550 acres in the district. Bonds to the amount of \$765,000 have been authorized, and the full amount sold at par. Source of supply, the Bear Valley Reservoir. The Bear Valley system, with main office at Redlands, has an immense reservoir in the mountains, which covers 1,700 acres, and estimated to hold 200,000,000 gallons of water; supplies 41,000 acres of land, and the acreage can be increased vastly. The water is conveyed in iron pipes to the orchard or dwelling—no open ditches or wooden flumes allowed under the whole system. The cost of this great work was about \$100,000. The loss of water by evaporation or seepage is thus not worthy of note, and every gallon goes where it is made useful.

The railroad facilities in San Bernardino are of a very complete order, the Southern Pacific Company and the California Southern (Santa Fe) having a track and warehouse and depot facilities in every settlement in the county. Besides there are several motor roads, rendering rapid transit very easy. This agency has had no small influence in the general prosperity of the county.

Los Angeles County, while being the first to make a business of orange and lemon culture, struggled many years to gain a footing, and turned her attention at a very late period to the growing of deciduous fruits. Planting walnuts was an early enterprise, and profitable. Sixteen years ago a box of home-grown apples was a rarity, everything being "northern," that is, from the northern part of California and Oregon. But time has wrought changes, and the area of deciduous fruit alone in

Los Angeles County far surpasses a dream of sixteen years ago. It is exceedingly difficult to give a detailed estimate of the acres of fruit in the county by sections, the county being so large and fruit growing so universal.

All the standard varieties are fully represented in every locality, but the orange and walnut lead. More attention is now being paid to the olive, and a few years hence olive groves will cover many acres now barren and unproductive.

Scarcity of water at an early day was a serious obstacle to every kind of husbandry, especially so to horticultural efforts, but that is now in a wonderful measure overcome by innumerable reservoirs, canals, tunnels in the Sierra Madre Mountains, artesian wells, and a vast system of irrigation pipes and flumes. More water has in late years been developed by tunnels, springs, and impounding dams than flowed out into the plains before that period of development began. It is all used judiciously, and more is being sought for and found constantly.

A plan is being prepared for conveying water from the Tejunga Cañon, on the north side of San Fernando Valley, across the foothills, in pipes, to the Cahuenga Valley, an immense body of valuable land to the west of Los Angeles City. There is fair prospect of the plan being successful. This will bring under cultivation nearly 100,000 acres of rich land now comparatively valueless, save in a limited sense, unless it may be in a season of late rains, an uncertain matter. Part of this valley is a frost-belt, and produces wonderfully.

The oldest olive orchard in the county is at old San Fernando Mission, but it has been sadly neglected. This valley has now 1,500 acres in fruit, but not all bearing. The Porter Land and Water Company is pushing developments here.

At La Cañada progress in fruit culture is very marked. On this elevated plateau Mr. Ed. Dunham, Dr. Lanterman, Col. T. S. Hall, Gen. J. H. Shields, and many others have fine places. The same is to be said of every favorable locality westward around the whole great valley. Burbank has 1,628 acres of walnuts, 420 acres of pears, 295 of prunes, 595 of peaches, 260 of apricots, and 272 of apples, and many other fruits.

Eagle Rock district is turning its attention to walnuts and olives. Whittier to walnuts largely, but all other fruits are well represented. Glendale, Verdugo, and West Glendale are interested in every kind of fruit grown, deciduous and semi-tropical, and have over 2,000 acres in cultivation.

At Glendale, Judge E. M. Ross and Captain C. E. Thom have orange orchards of 120 acres each.

Mr. Carl Rosecrans, at Rosecrans Station, Redondo Valley, has over 100 acres of fruit on dry upland, which is not surpassed anywhere.

Antelope Valley, a part of the Mohave Desert, is used in an elastic manner, and is made to include a large district bordering on the slope of the desert, and is showing well in the fruit line, reporting fully 2,000 acres in fruit and grapes.

Downey is an apple district, but does not neglect other fruits and walnuts, having about 1,200 acres of the latter. Mrs. F. A. Ardis, John Bangle, R. D. Bedwell, N. H. Hughes, G. W. Hutchings, James Stewart, and a long list of others are interested here.

Rivera and Los Nietos is the walnut district, but showing consider-

able attention to the orange. Of the walnut there are over 1,200 acres; of oranges, 465; other fruits in good variety. C. A. Coffman, Tracy Abbott, J. A. Montgomery, L. L. Bequette, D. W. Cate, Wilbur Cate, Ida Dunlap, and more than two score others are identified with this industry.

The Walnut Growers' Association, embracing the above districts and a few outside growers, contracted its crop, for 1892, at from 7½ cents a pound for hard-shell nuts to 8½ cents for soft-shell, which will aggregate, from careful estimates, \$90,000.

The unclassified vine disease having destroyed nearly every vine in a large portion of the county, the acreage and product do not count up as in former years.

Pasadena, the "crown of the valley," by reason of cutting up many orchards into town lots, and turning many blocks into ornamental grounds, has not the acreage to show as formerly, consequently the fruit grower has had to move back. Still the place has 331 acres of apricots, 963 of peaches, 500 of prunes, 113 of lemons, and 1,000 of oranges. About 3,000 acres are in fruit and table grapes. Dried peaches sold for 12½ cents per pound; prunes, 10 cents, and apricots, 12 cents. About 600 acres were planted the last season.

Mr. W. R. Baker is engaged here in putting up all kinds of fruits in glass, in various forms, as well as dried and otherwise preserved, by a process entirely his own. The product of his establishment has an excellent name, and compares favorably with any imported glacé fruit. Canning factory statistics were not available.

The district about Pomona, the "Goddess of Fruit," is now pretty well known, and the orchards here have no superior in California. Every one vies with his neighbor in increasing his orchard and in caring for it afterwards. Pomona had, at the beginning of the season, 3,292 acres in oranges, 279 in lemons, 204 in pears, 934 in prunes, 311 in peaches, 276 in olives, 492 in apricots, and 195 in walnuts. Other fruit in less numbers.

The raisin shipments from Pomona and North Pomona for the month of September, 1892, amounted to 243,780 pounds. This is a gain of 67,000 pounds over 1891. The whole raisin crop of Pomona Valley has now been shipped, the market being Chicago and New York. The green fruit shipments from the same stations for the months of July, August, and September, amounted to 416,000 pounds. This is a gain of 70 per cent over the green fruit shipments of any previous season. The heaviest shipments from Pomona were of peaches and pears. Of the former about 260,000 pounds were shipped, and of the latter 148,000 pounds. The Golden Cling peach is most largely grown, and the average net profit to the growers of this peach was \$63 a ton, and to the Bartlett pear grower \$59 a ton. Such great success resulted from green fruit shipments from Pomona this year, that every deciduous fruit grower in the place will arrange to sell his fruit that way in the future. The shipments of dried and green fruit for the season were 187 carloads.

Evidence from all districts which have in the past been scourged with the vine disease seems to tend to the conclusion that the disease has run its course. This is alike true in Los Angeles and Orange Counties. Considerable vine planting has been done in the two years past, and in all cases the vines do well and bear freely, giving no indications that they are affected in any manner.

Mr. J. L. Howland, of northern Pomona, is erecting an olive oil mill, designed to be modern and very complete.

The canning establishment here consumed a great amount of the fruit, still an enormous quantity was dried by growers and sold at the door, cash being paid on the spot, from 8 to 14 cents per pound.

Rev. C. F. Loop is extensively engaged in olive culture here, and takes great pride in his work. Mr. Alfred Wright has also a large number of trees growing and in nursery. When the acreage here comes into full bearing the oil and the pickled olive will be articles of importance in a commercial way. The many handsome orange orchards and those of other semi-tropical fruits about Pomona are a means of wealth and happiness as well as beauty.

C. E. White, E. R. Meserve, Ernest Dewey, E. P. Naylor, George Rhorer, T. D. Leslie, C. D. Ambrose, George Withers, J. W. Stringfield, Fred. J. Smith, Stoddard Jess, C. L. and C. A. Loud, M. C. Allen (but their names are legion, and why continue the list), have orchards of citrus and deciduous fruits, which would test the bank account of wealthy men to buy; and they secured them by breaking up the ground and planting the trees.

The San Gabriel Valley, which includes Alhambra and vicinity, possesses within her limits some of the largest orange orchards (the lemon, walnut, and other fruits are part of the ranches) that can be found on the continent. The scale bug scourge came, and laid a mailed hand on the great orchards, but was finally driven out, and the injury is now little seen. Here J. DeBarth Shorb, The Rose Company, J. R. Dobbins, A. B. and A. S. Chapman, J. F. Crank, Abbot Kinney, N. C. Carter, C. C. Thompson, E. L. Maybury, and several score of others, have orchards from 5 to 30 years old, which leave little to be wished for. Hundreds of acres have been newly planted in this vicinity, and hundreds more are being arranged for. The time was, and not far away in the past, when a shipment of oranges from any one of these orchards, of about what would now be a carload, or so, would overstock the market of San Francisco (the only market in that day), and give poor return to the grower. The United States is the market now for oranges grown in Southern California.

The oranges grown are largely seedlings, but they bear freely, the fruit is excellent, and the demand is steadily increasing.

Along the slope of the mountains, taking in Sierra Madre, Santa Anita, E. J. Baldwin's magnificent ranch, Monrovia, Azusa, Duarte, and contiguous country, the old orchards are looming up in fine order, and new ones are constantly being planted. The Duarte oranges have a distinction similar to the Navel, and command the highest rate in the market. A severe wind storm prevailed in this county in December, 1891, and a current went through the valley eastward, denuding the orange trees of the greater part of the fruit, thus reducing the shipments by one half, at least, so the shipping returns do not show as advantageously as in past time.

In the lower or southern part of the county, around Norwalk, Florence, Artesia, Long Beach, Wilmington, Compton, indeed all the settlements, the same condition of things exists, and horticultural interests are stimulated to great progress. In these last named sections, Santa Fe Springs, too, walnuts are deemed most profitable, and many acres are now planted, and many more will be planted this season.

Everywhere one meets with the same depressing story—the great ranches known as the Spanish grants, being held so nearly intact, keeping hundreds of thousands of acres of land out of settlement. There were forty-two of these grants in Los Angeles County, covering from 5,000 to 121,000 acres each. Some of these are being segregated, others not.

The outlook is good; fruit is king; cattle, horses, sheep, and grain no longer occupy man's entire attention; horticulture has its thousands of followers, and the orchard gives a tenfold return for the same amount of surface.

The nursery stock—citrus and deciduous—would indicate that ample preparations are being made for future planting.

The prices obtained for green and dried fruit for the season were generally satisfactory, ranging for green from 1 to 3 cents, and for dried from 8½ to 12½ cents. The canneries at Pasadena, Pomona, and Los Angeles obtained, doubtless, what they needed on an upward scale of prices, and packers shipped a great deal more. By far the greater part was dried in the orchard, and sold to agents for shipment East.

Following is the statement of shipments of fruits, nuts, and raisins for the year 1891, for the counties of Los Angeles, Orange, San Diego, San Bernardino, Ventura, and Santa Barbara, by rail:

By the Southern Pacific:			
Citrus fruits, local.....	9,670 tons; through, 11,101 tons.		
Nuts, local.....	565 tons; through, 565 tons.		
Raisins, local.....	106 tons; through, 424 tons.		
Dried fruits, local.....	344 tons; through, 428 tons.		
Canned goods, local.....	406 tons; through, 428 tons.		
By the Southern California (Santa Fe) from Los Angeles, Orange, San Diego, and San Bernardino counties:			
Oranges.....	57,435,000 pounds.		
Lemons.....	378,000 pounds.		

Other fruits and raisins are massed with vegetables, the whole amounting to 41,360,000 pounds. In addition there were considerable shipments by sea from various points in the several counties.

Kern County, that portion lying south of the Tehachapi Mountains, was long ago given over to desert and general uselessness. The main portion of the county, lying north of this mountain range, was at about the same period of time considered good for nothing except range for cattle and sheep, affording those animals even scant sustenance. Until quite recently this opinion was universally entertained. But the mutations of time have wrought changes. The northern part of the county was once the undisputed domain of a very few men, and no attempt was ever made to subdivide and cultivate for many years, except to plant grain, a precarious occupation at best. But when the system of canals and irrigating ditches was devised grain and hay were more of an assured crop, and latterly some of the great ranches have been partially broken up and sold to small holders; and water being abundant, fruit growing has been given an impetus otherwise impossible. The principal district is around Bakersfield. The topography of the county is quite level, affording easy cultivation and thorough irrigation, and the fruit growers now engaged in that occupation make the most of it.

Experienced judges, after inspecting the apple, peach, and pear orchards of Kern, declare that in no country is the fruit surpassed, nor has

any section a more promising outlook for all deciduous fruits. This, then, may be deemed a settled fact. The same calculation is being made here as elsewhere, to add much to the fruit area as soon as the planting season arrives, and stock is being engaged therefor. Another thing is as apparent here as elsewhere: when orchards are neglected or trimmed improperly they lose in value. But in nearly all cases the orchards were well kept and trees breaking down with the weight of delicious fruit. Peaches predominate.

The fine orchards of Messrs. P. Randall and H. C. Park—60 acres peaches and 30 acres pears—were a source of considerable profit for years. So, also, was the 100-acre peach orchard of Mr. Charles A. Maul, just at the edge of town. The two varieties mostly grown here are the Orange Cling and the George's Late Cling; so the fortunate shippers were able to supply both ends of the market. They were shipped to Chicago mostly, and sold for \$1 per box.

The shipments were not all made when I was there, but it was expected they would reach 120 cars. The fruit was large and luscious, of a delightful "peachy" color, and well calculated to beguile purchasers at an advanced figure. In 1891 there were 79,500 boxes of peaches shipped.

There are many other orchards in the same vicinity, smaller in size but equally as prolific; such as those of S. W. Wible, 60 acres peaches, 110 acres prunes; Ben. Brundage, 30 acres prunes, 15 acres peaches; Chris. Stockton, 20 acres apricots; Mr. Lingren, 40 acres apricots; Milo McKee, Rosedale, 20 acres peaches; Lowell Bros., 50 acres peaches; S. Jewett, Bakersfield, 100 acres prunes; J. E. Smith, 20 acres figs and 5 acres peaches, and so on.

At Delano a considerable area has been planted to peaches, pears, and prunes, as also at Poso and adjacent country, Miramonte, Glenville, Kernville, Tehachapi, Weldon, Onyx, and clinging to the mountains at Caliente and Keene, and at the Tejon ranch; all have a good showing of deciduous fruit trees, but generally for home use.

Raisins are a source of profit and a certain crop. The Rosedale Vineyard Company, of which Mr. R. Frizelle is manager, formerly of Riverside, has 320 acres, every vine in splendid health and weighted with fruit ready for the drying tray. Around this vineyard were five sections of land well covered with vineyards, all in the same condition. This acreage, together with vines connected with fruit orchards, increases the area to nearly 2,500 acres.

Grain growing on a large scale, in this immediate vicinity, is now a thing of the past. Its uncertainty—half or two thirds of a crop once in three or five years—offers little inducement when compared to fruit. Insect pests have not, as yet, made much headway in this county.

A new canal has been projected of about 60 miles in length, to take water well up the Kern River and convey it through the barren plains east and south of Sumner, to irrigate that great arid area. When that is completed another fruit belt will be opened, and trees planted where now not a living useful tree or shrub has footing.

The price of fruit was good in 1890, \$1 a box net; in 1891, very low; in 1892, good again, about the same as 1890. Dried fruit from 8 to 12 cents per pound. Many horticulturists dried their apricots and peaches. At present there are no canneries in the county.

Mr. S. W. Fergusson, manager of the Kern County Land Company,

is doing everything he can to forward fruit planting, and so is the water company with which he is connected. There are a large number of water companies in the county; the facts concerning them appear elsewhere in this report.

Beans, fruit, and nuts, in about the order named, have been for some years the staple products of *Ventura County*. The county is an old one, and for many years produced other things to the exclusion of fruit. The county being shut away from any market for perishable products, turned its attention to non-perishables. Now things have changed; it is comparatively easy of access, and horticulture is taking front rank.

Every new town located and established in the past seven years made fruit growing a distinct object to secure settlement, and all available places in a rather restricted area near the ocean have been utilized for fruit, and many places which three years ago were thought worthless have now thriving orchards of deciduous fruits, lemons, oranges, walnuts, and olives; but as they are all young the net results for profit do not present a large figure. People are not generally stopping the raising of fine stock, horses and cattle, to plant trees, so the old ranges have not been much intruded upon by the tree grower.

At Camulos the Del Valle Bros. have an old seedling orange orchard of 15 acres, and it has borne annually a large crop. They also have 25 acres in walnuts, 25 acres in olives, 25 acres in almonds, and raise a variety of other fruits. Oranges are sold to packers. Montalvo has 350 acres in fruit and nuts.

Piru, a dry, bleak, forbidding place in appearance, has been subdivided and planted to deciduous fruits, olives, and nuts, D. C. Cook having planted about 150 acres in fruit, olives, and walnuts; his neighbors have done likewise, and now there are several fine orchards here.

Around Santa Paula apples, peaches, pears, and walnuts take precedence, but do not crowd out the toothsome bean. Horticulture will be of slow growth in this district and county, as good bean land is thought to be as profitable.

Saticoy has a fine fruit district, and a plain of 12,000 acres toward the ocean, west of Santa Paula, with small orchards in many places. E. W. Harold is here growing olives and walnuts.

The lemon is brought to perfection here, and Mr. N. W. Blanchard has established a reputation purely his own in its care and preservation. A return of \$4 to \$6 a box for his lemons leaves a good margin for profit. He also pays attention to oranges and walnuts, and they find a ready market. He, too, has solved the problem of lemon curing, and reduced it to a science, with no necessity for further experiments.

Nordhoff, situated in a valley in the mountains to the east of Ventura, is showing up finely with grapes, walnuts, deciduous fruits, and oranges. The outlook is bright for future products as the trees mature.

Up the valley of the river, back of Ventura, there is a goodly number of small fruit orchards, nicely kept and fruitful. But the staple is beans. Dairying business receives much attention also. Statistics of shipments were not readily obtainable. The area of fruits, olives, almonds, and walnuts is constantly increasing, and Ventura will soon find herself astonished when they all come into bearing.

There are now in Ventura nearly 6,305 acres in walnuts, bearing and

non-bearing; 150 acres of almonds, 1,057 of apricots, 548 of oranges, 443 of lemons, 843 acres of prunes, and 613 acres of olives, and a large area of other fruits. The apple and peach of Ventura are a delight to the palate.

The principal irrigation company is the Bardsdale Ditch, 3 miles in length, carrying a volume of 750 inches of water. It has 3,200 shares, and distributes its water at the rate of two shares per acre.

Many places in the county are not irrigated, and the two dry years have left an effect quite noticeable.

Santa Barbara County is another of the old counties, yet but little developed in horticultural interests, speaking in general terms. But the march of improvement and a change in conditions confronting people all over the southern part of the State reached this county as soon as anywhere, and the result is apparent. Sheep and cattle are relegated here also, and horticulture more than agriculture has taken their place.

The Southern Pacific Railroad, which runs through Ventura and to Elwood, in Santa Barbara County, has connected this county with the outer world, and access to market is secured. With the completion of the road to San Francisco, no one can predict where the advancing strides will cease.

The fruit and nut ranch of Hon. Ellwood Cooper is a place of ideal loveliness. Mr. Cooper located on it twenty-one years ago, and commenced planting olives, almonds, walnuts, Japanese persimmons, oranges, and lemons, and a select assortment of deciduous fruit trees. He has on his place over 9,000 olive trees, not all in bearing, however; 4,500 persimmons, 10,000 almonds, 3,000 walnuts, and 1,700 vines, etc. His chief study has been the production of olive oil, and after years of arduous labor, care, and patience, his success is assured, and the oil now branded "Ellwood Cooper, Santa Barbara," is known wherever olive oil is used, and has no superior in the world. His oil product of 1890 was 34,000 bottles. Mr. Cooper is the pioneer in introducing this industry, and his name will always be associated therewith.

For two years the rainfall at this place has been deficient, and the olive, walnut, and almond yield was very small, especially from the trees on mesa lands. In the future this is to be remedied; a company has purchased the ranch, and one of the first pieces of work done will be the construction of a dam in the cañon belonging to the ranch, and the impounding of water for irrigating the whole place. This has never been found necessary before.

There are about 18,000 acres of fruits of all kinds in the county, but a very considerable number of these acres are in small orchards and cut no figure in the market, and on ranches for home use. Enumeration is difficult in a county so difficult of access as Santa Barbara, only in the settlements where the chief orchards are situated.

It is a superb fruit belt along the foot of the mountains from Santa Barbara City to Elwood, 15 miles, and the orchards are grand and productive.

Russell Heath's walnut orchard at Carpenteria, comprising many acres, is in prime condition. C. F. Eaton has another fine place at Montecito. At this place the Crocker ranch of 250 acres is being planted out to lemons, and Mr. Kinton Stevens is caring for an immense orchard of oranges, lemons, and nuts. Mr. Stevens smote the rocks so

to speak, and they put forth abundance of water; in other words, he tunneled into the mountains and procured a splendid stream of water, sufficient to irrigate all his trees and enough for his neighbors. It is water that does it, after all.

Around the decayed old Mission of Santa Ynez, and dotted all over the valley, are extensive fruit orchards, many of them too young to show much yet, but they will count well by and by. The orchards are olive, apple, peach, and apricot. Max Dormer's peach orchard, in addition to other trees, contains 12,000 peach trees, while Mr. Torrence has 1,500 apricots and the same number of prunes. Other orchards in the vicinity swell the number by 6,000 trees. In the whole valley there are about 2,000 acres in fruit.

At Los Olivos, Ralph R. Selby has 12,000 olive trees; A. M. Boyd, 10,000; A. S. Boyd, 5,000, and Haines Bros. and Gould, 9,000, just now coming into bearing. A number of other orchards of less area are in the vicinity. About 200 gallons of oil were made in 1891.

Los Alamos has a little over 200 acres, varied in selection, but largely apple. It is a quiet, easy-going old town. Grapes do well in all these places, and almost everywhere a small vineyard is growing. Cherry trees also thrive and produce well in all these sections. The orange, lemon, and walnut do not thrive. Around Ballard there are about 1,000 acres of fruit trees of all kinds.

The fruit from this section was dried in the orchard in some instances, but much went to the new cannery at Santa Maria. Good prices were realized.

Apples are chiefly grown at and near Lompoc, there being over 250 acres of mixed varieties.

Santa Maria Valley is the gem of the north end of the county. It has an immense area, nearly every acre of which is capable of fruit culture, but as yet the orchards are not numerous, but thrifty and bearing well. It has no access to a market for green fruit, and so the citizens erected a cannery last year, which took everything it could get, and then shut down for want of stock. Following is the output:

Between 90 and 100 tons of fruit were bought at an average of about \$27 50 per ton. Cash expended for labor, \$2,369 27; for fruit, \$2,482 15. The pack is not yet itemized, but in point of value apricots stand at the head, with pears second, and peaches third.

Jones & Maulsby have 100 acres in fruit; Kaiser Bros., 400 acres in fruit and nuts; J. W. Hudson, 20 acres, and A. Willheimer, 100 acres. Smaller orchards are numerous. Railroad communication to a point to place fruit on the market, would increase this valley's possibilities. The dairy interest, however, on the coast, where steamships call and transport the product, is asking but little, and is doing well.

San Luis Obispo is another of the old line of coast counties but little exploited and but little known until quite recently. It, too, is retarded in a way truly overwhelming from the same cause as the district south, and also from the cause that holds in restraint all the districts I have traversed—the great, unbroken ranches, covering the larger portion of all the counties composing it, and in many sections the better portion. The mountainous region will always be grazing ground, but the valleys, in the future, can be turned to better and more profitable uses, as they are numerous and have a soil capable of producing anything which may be planted.

The coast-line of San Luis Obispo County has long been devoted to dairying, and it is a "cow county" in a pronounced sense. Its reputation for dairy products is established, and the profit arising therefrom makes horticultural pursuits shrink to the background. But the inland valleys are beginning to feel the impulse given by fruit raising, and many orchards are beginning to make a showing.

Arroyo Grande has numerous orchards which promise good returns. All told there are about 150 acres of general variety. Mr. H. Carpenter has a walnut grove besides the above of 50 acres.

At Nipomo a large amount of land has been planted in fruit, all the deciduous, and nuts, and much more is being prepared. A fruit and orchard company, of which Mr. C. H. Reed is Secretary, has 220 acres already growing, trees about three years old, divided about as follows: Apricots, 8,500; prunes, 10,000; walnuts, 1,200; apples, 1,000; pears, 200; peaches, 1,000. They have also planted 300 lemons and are preparing ground for 8,000 more trees of mixed varieties. Messrs. Dana, Wood, Peterson, and Runnels have planted from 40 to 60 acres each, the prune being preferred. Other orchards there aggregate about 10,000 trees, of from 10 to 15 acres each. The area covered by vines is also very large.

Around San Luis Obispo, the county seat, fruit growing is a well-established occupation. The same may be said here as of all other settlements around, that with transportation facilities such as the county deserves, no present estimate could be made of the carloads of fruit, green and dried, which would be shipped to a market from here. But for all that the orchards are numerous and in good condition, and a large acreage will be planted the coming season.

Apples, peaches, pears, and prunes are largely preferred, but almonds, olives, and walnuts count a heavy aggregate. Goldtree Bros., P. H. Dollidet, Jr., R. Dominquez, J. C. Cherry, Geo. T. Gragg, Mrs. Teresa Harris, Capt. W. B. Pritchard, J. H. Thompson, and many others are turning their attention to this industry.

At E. W. Steele's ranch, at Edna, the visitor is always welcome, and the art of fruit raising and dairying can be studied with profit. Judge Cotton's ranch, at San Miguel, of 220 acres of prunes and peaches, is a wonder. John Steward also has a fine orchard of assorted fruit. Around Cambria are about 500 acres of general varieties, and Creston has a large fruit area.

Around Templeton and Santa Margarita the fruit outlook is excellent, many turning their attention that way. J. H. Von Schroeder has a little plant of 29,000 prune trees, but they were touched with frost in March, 1892, and their recovery has not been sufficient to predict the fruit-bearing outlook.

Paso Robles has direct rail communication, and here many orchards are growing finely, and much land will be planted this season. R. M. Shackelford has 200 acres in prunes and pears, and many others are planting to the extent of their ability. This is a natural fruit region, and is coming to be recognized.

The number of fruit trees in the county, by acres, is as follows: Apple, 370; apricot, 366; cherry, 112; fig, 34; olive, 128; peach, 509; prune, 1,144; pear, 355; lemon, 140; orange, 20; almond, 39; walnut, 479; grapes, 925. This does not include small places of one acre or less. Surely a good showing for a stock-raising and dairying county.

TRANSACTIONS

OF THE

STATE BOARD OF HORTICULTURE.

JULY, 1892.

TRANSACTIONS OF THE STATE BOARD OF HORTICULTURE.

JULY 19, 1892.

Present: Commissioners Block, Mosher, Kimball, White, Miles, Thomas, and President Cooper. Absent: Commissioners Buck and Runyon.

The minutes of November 19, 1891, were read and approved.

The report of the Treasurer showed the payment of the following amounts to cover claims:

1891—Nov. 10.....	\$472 83
Dec. 22.....	811 10
1892—Feb. 13.....	1,662 58
Mar. 8.....	558 35
April 30.....	1,308 95
June 8.....	466 26
	<hr/>
Amount paid up to last report	\$5,580 07
	4,107 85
Amount paid up to last date.....	<hr/>
	\$9,687 92
Balance	<hr/>
	\$312 08

The Executive Committee presented their report, showing the amount of work performed during the year, examination of books, etc. (see report on page 6).

The report of the Secretary was read, covering a period since the last meeting. The expenditures for the forty-third fiscal year were reported to be \$9,687 92, leaving a balance of \$312 08. The publications issued were reported as follows:

Annual report for 1891	10,000 copies.
Treatises, etc.	70,500 copies.
Bulletins	50,500 copies.
Miscellaneous circulars, posters, etc.....	20,000 copies.
Total.....	<hr/>
	151,000 copies.

On hand for distribution:

Report for 1891.....	2,500 copies.
Treatises	16,400 copies.
Total.....	<hr/>
	18,900 copies.

The report called the attention of the Board to the necessity of the enactment of new laws, as follows:

To prevent the adulteration of food and products, especially olive oil, sold under false labels.

To prevent the adulteration of commercial fertilizers, and their sale under false representation.

To prevent the use of boxes by firms and individuals, bearing the name of certain localities, while their contents are made up of refuse fruit.

To ask the Legislature for an increased appropriation to enable the Board to employ an assistant to collect and compile statistics of fruit and condition of crops, etc., and issuance of a monthly bulletin to disseminate such information at the proper time.

The following rules for the distribution of annual reports and other publications were passed:

WHEREAS, The annual report of the State Board of Horticulture for the year 1891 is a volume of great value; and whereas, it is the desire of the Board to place said reports among the fruit growers throughout the State, and in such places as will be accessible to them and to those otherwise interested in fruit products, or who are desirous of getting information with the view of becoming fruit growers, that the object of issuing these reports may be more fully accomplished:

Resolved, That the same shall be distributed (one copy each) as follows:

1. To all State, county, and school libraries.
2. To all public offices.
3. To all departments of State.
4. To all members of the Legislature.
5. To all newspapers in the State.
6. To all colleges and other institutions in America and foreign countries on exchange list.
7. To fruit growers.

RULE I. The cost of mailing, or express charges, to be paid by applicants for the same.

RULE II. All reports to be forwarded through the mails or express, from the office; and no packages shall hereafter be sent to persons, etc., for distribution.

RULE III. Each person receiving a report shall render a receipt therefor (naming residence), and they shall be filed in the office, and an accurate account kept of all reports distributed.

Agents were ordered employed temporarily to collect statistics, etc.

HORTICULTURAL QUARANTINE.

The report of the Quarantine Officer showed that as San Francisco is the principal port of entry for trees and plants from foreign countries, it occupied the greater portion of his time inspecting steamships and vessels, thus guarding the State from new pests and diseases that might arrive on trees and plants. The duties of the Quarantine Officer are coextensive with the State in the enforcement of the quarantine laws, etc., and he has made a general surveillance of all the counties in this work. No doubt the enforcement of laws, etc., has caused antagonism and hard feelings, which cannot be avoided in such cases. The rights of the people must be protected, and to this end these laws have been enacted. The press of the State and the fruit growers have aided him materially in the discharge of his arduous duties.

In June, 1891, a cargo of orange trees arrived at San Pedro from the South Sea Islands. These were at once placed in quarantine, as they were infested by a dangerous pest. The owners were given every opportunity to destroy the pests upon them, but in this they failed, after repeated applications. Condemnation suit was then brought, and in August the case was tried, and the owners were granted further time to disinfect. Last December the trees were again inspected, and found to be still infested with the pests. The Quarantine Officer then wrote to the Attorney-General to have the suit before the Superior Court at Los Angeles reset for trial, as the trees would endanger the fruit industry, should the pests upon them spread. The case was heard by the Court

in February, and the cargo of trees ordered destroyed by burning. The Commissioner for Los Angeles County, on March 29th, carried out the order of the Court.

Various carloads of trees arrived during the season in different parts of the State, and the inspection of these required his personal attention. He has instigated several suits before the Courts to condemn trees and plants brought into the State infested by dangerous pests and diseases, and which pests could not be destroyed, or the diseases cured, without the destruction of the trees. Thus many new pests and diseases have been prevented from spreading in our State.

The quarantine laws should be further amended, giving this officer more and definite power, as delays in the enforcement of the laws oftentimes prove dangerous.

ELECTION OF OFFICERS.

President Cooper announced the next order of business to be the election of officers for the ensuing term, viz.: President, Auditor, and Treasurer, and vacated the chair. In the absence of the Vice-President, B. M. Lelong, Secretary, occupied the chair, and declared nominations for President in order. Commissioner Ellwood Cooper was unanimously reelected President by acclamation.

ADDRESS OF PRESIDENT COOPER.

GENTLEMEN: I have on previous occasions thanked you for the compliment in being reelected as President of this State Board of Horticulture, and at this time, more than ever, I am impressed with the responsibilities imposed in accepting the position. While I believe it is your earnest wish that I should remain in this position, and for this good opinion am grateful, still you must be aware that the task is no easy one, and requires more of my time than I can afford to devote to the work. Nearly one half of my time is given outright to the State, for which I receive no substantial compensation. Your good opinion must be my reward.

We have arrived at that point in our horticultural work that calls for greater efforts than at any previous period, and probably the turning point that must mark the future advancement. I call your attention to the first part of my opening address before the Santa Cruz Convention, to be found on page 265, report of 1891, and had I not made the remarks I did on a similar occasion to this, one year ago (see page 14, same report), I should have done it at this time.

We have compiled a series of reports that have had no equal. It is a monument to the State of California, and a credit to the fruit growers. We have, in the line of this work, about completed many branches therein treated, and must change, somewhat, the current of our thoughts, and embrace other subjects that concern our civilization. The waste of money, the waste of energy that results in undertaking impossible things, impresses me more seriously from day to day, and I must refer you to the presentation to Albert Koebele (page 290, report of 1891). I refer you to the three addresses, as above mentioned, for the reason that what is therein expressed is the basis upon which all my ideas are founded. I do not wish to encroach upon your time in repeating.

I have glanced over the reports of our Secretary and Quarantine

Officer, and find that there have been issued from our office reports, treatises, bulletins, and miscellaneous matter numbering one hundred and fifty-one thousand copies since our meeting one year ago. There are on hand of these publications only eighteen thousand nine hundred copies, showing that about one hundred and thirty-two thousand have been distributed. There are now thirty thousand copies being prepared for distribution, containing very important information.

The value of our annual reports has been established by the fact that they have been advertised for in the daily papers and \$5 offered per volume.

The inspection of steamers and vessels, as also railroad cars, has become a very arduous task. Eighty-four in number have required the attention of our Quarantine Officer. Over 900,000 plants have been inspected, of which were destroyed 326,500; the number quarantined is over 500,000. All these matters, however, are in full detail, and I refer you to the reports of our officers.

It must be apparent to all of you that if this work is to be continued more clerical force will have to be employed, and hence a larger appropriation. The demand for information on the part of the fruit growers, the necessities of our extended fruit products, do not admit of any curtailment. We must investigate, publish, and distribute, otherwise greater losses will result. Our quarantine regulations require more force, in order that the fullest benefit can be derived. New insects are appearing, also fungoids, not before observed. The inroads made by these enemies on the fruit products is a serious loss to the fruit growers, and, if not arrested, will make it impossible to continue the business, and entail millions of dollars of loss to the State. Shall we rest and see everything go to waste and destruction, or shall we go on and become the greatest fruit garden the world has ever seen?

The experience we have had, and the marvel in the work of the *Vedalia*, is certainly sufficient to convince every intelligent being that by no other plan can we accomplish what we have set out to do. All noxious insects have parasites or predaceous insects that feed upon them, and prevent them from becoming a bar to successful fruit growing. Is it not wiser, therefore, to search for these parasites, to prevent the spread of our dangerous foes, than to endeavor to take this matter out of the hands of the Creator to manage in our own way? At best, washing, fumigating, or any other method can only keep in check temporarily the destructive enemy until such time as the parasite could be found to do the work as nature intended.

With the full conviction, therefore, that by no other means can our success be complete, we must ask for a large appropriation for this purpose. The work that we have accomplished is known only to the few, comparatively speaking. I therefore must urge, as I have done before, that we must republish all our reports from 1885 to the present time in an abbreviated form. It is necessary for the benefit of the fruit growers. It is necessary for the benefit of public education, and it is necessary for the honor of the State of California to have such a work to exhibit at the Columbian Exposition, to show to the world what has been done in the line of horticultural literature. This matter must be brought before the convention, and steps taken to secure a sufficient sum to accomplish the work.

I also beg to call your attention to the propriety of having an orange

tree, or a small tree of some kind, full of *Icerya* sent to Chicago, put in a safe house and the *Vedalia* put upon the tree, that the visitors can see its work. It would be an object lesson. What instruction could be as lasting to every thoughtful mind?

The time has now arrived when we should more seriously consider the propriety of having fruit inspectors, more control over the railroads, and a combined effort to distribute and sell our fruits. I should recommend the fullest discussion of these subjects at our next convention. There exists a general dissatisfaction with the results of sales made by commission houses. It is claimed by many that the distributors grow rich while the producers in many cases, with the greatest economy, can barely live. The prices of fruits the past year were lower than for many years past. The railroad rates were higher. In some cases money had to be sent East to pay freight deficiencies, the producers losing everything and borrowing money to pay the exorbitant railroad rates.

This state of things must be changed. I outlined all these subjects at the convention held in National City (see report of 1889, page 330).

I hope that the Board will consider these questions, and that they will be fairly presented at the convention to be held at San José in November next. And in conclusion, I urge that each member may mature some plan that will lead to a satisfactory solution of one or more of these subjects suggested.

We should also make it our individual duty to instruct or impress upon our representatives the necessity of such legislation as will secure a sufficient appropriation to carry out such measures as we feel would best advance the fruit industry.

TREASURER.

Commissioner Fred. C. Miles was elected Treasurer by acclamation.

AUDITOR.

Commissioner J. L. Mosher was unanimously reelected Auditor by acclamation.

A general discussion was then indulged in by the Commissioners present and suggestions made as to future transactions.
Adjourned.

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TWELFTH BIENNIAL REPORT
OF THE
STATE BOARD OF HEALTH
OF
CALIFORNIA,
FOR THE FISCAL YEARS FROM JUNE 30, 1890, TO JUNE 30, 1892.



SACRAMENTO:
STATE OFFICE, : : : : A. J. JOHNSTON, SUPT. STATE PRINTING.
1892.

OFFICE CALIFORNIA STATE BOARD OF HEALTH,
SACRAMENTO, September 15, 1892.

To his Excellency H. H. MARKHAM, Governor of California:

SIR: I have the honor to present to you, in compliance with the laws of the State, the twelfth Biennial Report of the State Board of Health, for the fiscal years from June 30, 1890, to June 30, 1892.

Very respectfully,

J. R. LAINE, M.D.,
Secretary State Board of Health.

GENERAL REPORT OF THE BOARD.

MEMBERS OF THE CALIFORNIA STATE BOARD OF HEALTH.

TO APRIL 20, 1891.

President.

HENRY S. ORME, M.D. Los Angeles.

Secretary.

GERRARD G. TYRRELL, M.D. Sacramento.

W. R. CLUNESS, M.D. Sacramento.

R. BEVERLY COLE, M.D. San Francisco.

JAMES SIMPSON, M.D. San Francisco.

J. M. BRICELAND, M.D. Shasta.

C. A. RUGGLES, M.D. Stockton.

PRESENT MEMBERS OF THE STATE BOARD OF HEALTH.

W. G. COCHRAN, M.D. Los Angeles.

J. R. LAINE, M.D. Sacramento.

W. R. CLUNESS, M.D. Sacramento.

C. W. NUTTING, M.D. Etna.

C. A. RUGGLES, M.D. Stockton.

P. C. REMONDINO, M.D. San Diego.

OFFICERS OF THE BOARD.

W. G. COCHRAN, M.D. President.

J. R. LAINE, M.D. Secretary.

To his Excellency H. H. MARKHAM, Governor of California:

SIR: Agreeable to an Act establishing a State Board of Health, and defining its powers, the twelfth Biennial Report of the State Board of Health is hereby submitted.

The purpose and ultimate object of establishing the California State Board of Health is the conservation and improvement of the public health. All the functions with which the Board may be endowed are specifically designed for the promotion and accomplishment of this end.

The law specifies that the Board must place themselves in communication with the local Boards of Health, hospitals, asylums, and public institutions throughout the State, and take cognizance of the interests of health and life among the citizens generally. They must make sanitary investigations and inquiries respecting the causes of disease, especially of epidemics, the source of mortality and the effects of localities, employments, conditions, and circumstances on the public health, and gather such information in respect to these matters as they may deem proper for diffusion among the people. They may devise some scheme whereby medical and vital statistics of sanitary value can be obtained, and act as an advisory Board to the State in all hygienic and medical matters, especially such as relate to the location, construction, sewerage, and administration of prisons, hospitals, asylums, and other public institutions. They must, at each biennial session of the Legislature, make a report, with such suggestions as to legislative action as they deem proper. It is also made the duty of the Board to examine into and report on the effect and use of intoxicating liquors upon the industry, prosperity, happiness, health, and lives of the citizens of the State, and what legislation, if any, is needed in the premises.

These specified duties are general in character, and make the functions of the Board purely advisory, with no mandatory authority over any condition or influence, however dangerous, which may threaten the health and life of the people of the State. In regard to the functions and duties of the Board, so far as they relate to any of the influences which affect public health, they are wholly performed when the Board suggests or advises what ought to be done. In other respects its function is that of a public educator, in teaching the precepts of health and the fundamental laws of public hygiene. This includes assistance and persuasion in organizing local Boards and calling attention to their duties and responsibilities, and indicating the direction which will make their efforts effective.

The only branch of public hygiene which, in the exercise of official function, possesses executive power to execute and enforce sanitary laws, is the local Board of Health. To bring the State and local Boards into a closer relation, tending to a uniformity of general action in sanitary work, will be the aim of the State Board.

The monthly reports of deaths and diseases published by the State Board are obtained exclusively from the Secretaries of local Boards, Health Officers, and physicians, who perform this work gratuitously for the public good. The Board is wholly dependent upon such sources of information for its knowledge of the condition of the health of the State. In order to utilize the information so received it is the custom to issue a

monthly circular to all the local Boards of Health, and to such other citizens who may desire it, giving as accurate a statement of the condition of the public health during the previous month as can be made from the facts obtained. There has been an active interest and willing coöperation on the part of correspondents. It is the intention of the State Board to invite the local Boards and correspondents to meet in convention, to council as how best to increase the efficiency of the sanitary authorities of the State. As all real authority is vested in the local Boards, it is manifest that the greatest effectiveness will be reached by organization.

The remainder of the appropriation to exclude contagious diseases from the State amounted to \$5,982 45, July 1, 1890. Of this sum there remained unexpended on July 1, 1892, \$5,732 45. The maintenance of a Medical Inspector on the Oregon line during the epidemic of smallpox in British Columbia, in July and August, reduced the fund to about \$5,300.

ASIATIC CHOLERA.

In view of the rapid spread of Asiatic cholera in Europe, and the probability of its reaching the United States before the epidemic dies out, the advisability of making a generous appropriation for inspection and prevention purposes, at the State lines where railroads enter the State, is earnestly urged.

Should it become necessary to establish quarantine and refuge stations, there are four points that should be fully covered to make it effective. It would be necessary to place one on the Oregon line in the north; another near Truckee; another at The Needles, and another at Yuma. In addition to placing Inspectors at those points to inspect all trains, it would be necessary to provide for the establishment of hospitals of some character, either tents or temporary board shelters, with the necessary supplies of bedding, food, and medicine, to care for the sick and well while detained. It is impossible, at this time, to estimate how much it will be necessary to do; but, if an attempt be made towards the establishment of anything like a rigid land quarantine, it will involve the expenditure of a large amount of money. In addition, it is necessary to take into account the number of people it will be necessary to employ in carrying out these measures. It will also be necessary for the State to quarantine the port of San Pedro. Inspectors will not only need to be paid, but people engaged in fumigating cars, baggage, and other effects, and those employed in nursing the sick in quarantine camps will doubtless exact larger salaries than they would receive in ordinary employment. We believe that these contingencies will justify a large appropriation to be made, under such restrictions as the Legislature may deem advisable. The Board, therefore, in view of the situation at this time (September 15th), recommends that an appropriation of \$50,000 be made for the prevention of contagious diseases.

Very respectfully,

W. G. COCHRAN, M.D.; President.
J. R. LAINE, M.D., Secretary.
C. A. RUGGLES, M.D.
C. W. NUTTING, M.D.
W. R. CLUNESS, M.D.
P. C. REMONDINO, M.D.

ABSTRACT OF PROCEEDINGS OF THE BOARD.

AS SHOWN BY THE MINUTES.

THE REGULAR QUARTERLY MEETING OF THE STATE BOARD OF HEALTH
Was held in the office of the Secretary, July 23, 1890.

Present—Dr. Orme, President; G. G. Tyrrell, Secretary; Dr. J. M. Briceland, Shasta; Dr. C. A. Ruggles, Stockton, and Dr. W. R. Cluness, Sacramento. Absent—Dr. Jas. Simpson and Dr. R. B. Cole, San Francisco.

The minutes of the last meeting were read and approved.

The Secretary reported that since the last meeting of the Board a communication had been received from the State Analyst, informing the Board that he was about leaving for Europe, and would be glad to represent it in the International Medical Congress to be held in Berlin, in August. As this was an opportunity for our Board to obtain, through Professor Rising, a report of the section on hygiene, I issued to him credentials as a delegate to the Congress from this Board, with a request that he report the proceedings.

On motion, the action of the Secretary was approved.

The Secretary reported that he had received a communication, accompanied by a long petition, from the citizens of Dunsmuir, requesting the Board to appoint a Health Officer for that town, the Supervisors refusing to do it, although it was claimed to contain five hundred inhabitants.

I wrote to the District Attorney, advising him of the request, and asking them to enforce the law. In reply I received the following:

YREKA, CAL., June 14, 1890.

G. G. TYRRELL, M.D., *Secretary State Board of Health*:

DEAR SIR: Your communication of date of June 9th has been received. I have looked into the facts and situation fully, and have concluded that it would be well to advise you of same before taking action. There never has been a petition presented to our Board of Supervisors for the appointment of a Health Officer for the town of Dunsmuir, by affidavit, or otherwise; that the town of Dunsmuir contains five hundred or more inhabitants. The Supervisor from that district stated that he was satisfied that the town did not contain the required five hundred inhabitants. The only written application ever made was by Mr. J. N. White. This was only a request for the appointment, and contained no showing whatever that the town was entitled to such appointment.

In the absence of official knowledge, which they cannot have in this case, the Board should have some satisfactory proof as to the number of inhabitants, before acting. The Board, no doubt, as soon as satisfactory proof is given that Dunsmuir is entitled to the appointment of a Health Officer, will make the appointment. Members of the Board tell me that the only reason for not making the appointment was the absence of proof that Dunsmuir is entitled to the appointment, and that when that is forthcoming they will promptly make the same. Please reply.

Yours very respectfully,

J. D. BEARD.

On receipt of the above, I at once forwarded the petition of the citizens to be presented to the Board of Supervisors, with a request that immediate action be taken, which elicited the following reply:

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G. G. TYRRELL, M.D., *Secretary State Board of Health:*

DEAR SIR: Received your letter yesterday, and also the petition forwarded to your Board from Dunsmuir. At the next meeting of the Board of Supervisors, I think that this matter will be adjusted satisfactorily. The Board meets on first Monday in July.

Yours truly,

J. D. BEARD.

Since that date the Board of Supervisors have met, but made no appointment. On motion of Dr. Briceland, the Secretary was instructed to wait until the official report of census was made, and then if it was ascertained that Dunsmuir contained the number of inhabitants to entitle it to a Health Officer, to have one appointed, which was carried.

The Secretary reported that he had requested the City Attorney of Monterey to have a Board of Health organized and a Health Officer appointed for Monterey. In reply he promised to attend to the matter without delay. Action approved.

The Secretary introduced to the Board a Mr. Schoonmaker, from Lodi, who desired to exhibit for the approval of the Board an adjustable bathtub seat for the use of the sick. The invention consisted of a metal or iron standard fastened to the wall, upon which a slatted seat with adjustable rack was placed. Upon examination by the Board, it was of the opinion that under many conditions the invention was likely to prove useful, and had no hesitation in recommending its trial by hospital or private institutions.

The Secretary was authorized to convey the Board's opinion to Mr. Schoonmaker.

Dr. C. A. Ruggles, delegate to the National Conference of State Boards of Health, begged leave to report verbally his action. He stated, as preliminary, that on his way south he traveled with a Dr. Stevens, a practitioner in New Mexico, who informed him of the great prevalence of smallpox in El Paso and Deming and vicinity, so much so that merchants were leaving in affright.

Dr. Ruggles, deeming this information of the utmost importance to California, at once wrote to Dr. Tyrrell, advising him to take immediate steps to ascertain the extent of the epidemic, and to establish quarantine, with the consent of the Board, if necessary.

Upon arriving at Nashville he was, on making himself known, received most cordially by the delegates at the conference. The principal discussion of the conference was upon the necessity of teaching the public the value of sanitation, and it was considered that this object was better attained by short articles for the press upon sanitary subjects, and the assistance of Boards of Health pamphlets upon the different zymotic diseases, and on house ventilation, disposal of garbage, and kindred subjects.

Dr. Lee, of Philadelphia, presented a very able paper upon leprosy. His opinion was that the disease was only contagious through inoculation. On the contrary, one doctor held that the disease was neither infectious nor contagious, giving several facts in defense of his theory.

Dr. Orme's report on leprosy was next presented to the conference by Dr. Ruggles, but no conclusion was arrived at by the meeting.

The next subject under discussion was the Interstate Quarantine law. Dr. Ruggles explained fully the position of California in regard to this matter. Dr. Bryce, of Ontario, Canada, introduced the subject of disinfection in contagious diseases by the use of sulphurous acid, supporting his theory in a very plausible manner. Dr. Rutherford, of Texas,

combated Dr. Bryce's opinion, and explained that he had no faith in sulphurous acid, but firmly believed in the efficacy of chlorine gas and fire, especially in fire. Dr. Bryce then presented a valuable paper upon the effect of denudation of the land of forest trees.

The question of this Board upon the preservation of potable water from pollution was then brought forward by Dr. Ruggles, and after some discussion the conclusion arrived at was that the only way of preserving the potable waters was by preventing their pollution by stringent laws. Dr. Ruggles then presented the resolution of this Board asking the amalgamation of the conference with the American Public Health Association, which was immediately voted down as impolitic.

Upon adjournment of the conference, Dr. Ruggles proceeded to Washington, where he presented his letter of introduction to our Congressmen, Hon. T. J. Clunie and Hon. Marion Biggs, who received him most cordially and conducted him to President Harrison, to whom he explained the wants of this coast in the way of sanitary protection. From there Messrs. Clunie and Biggs took Dr. Ruggles to see Surgeon-General J. B. Hamilton. While conversing with this gentleman on the necessity of maintaining a strict quarantine on our southern border, a telegram was received from Dr. Tyrrell asking the appointment of a Government Inspector in New Mexico, as smallpox was reported epidemic. Surgeon-General Hamilton at once complied and telegraphed Dr. Tyrrell that he had appointed Dr. S. S. Herrick to the position.

Dr. Ruggles' verbal report was received and the thanks of the Board returned, with the request that Dr. Ruggles furnish a written report for publication in the next Biennial Report, which was carried.

The Secretary begged leave to report that, as detailed by Dr. Ruggles, he had received a letter from the doctor giving him an alarming account of the prevalence of smallpox in Mexico, and advising immediate steps be taken to prevent its extension to California. Your Secretary at once consulted Dr. Cluness, the only member of the Board available in an emergency, and he advised that I at once proceed to San Francisco and, if possible, engage the services of Dr. S. S. Herrick, and send him south and into Mexico to ascertain how far our State was threatened and to what extent smallpox prevailed. On arriving at San Francisco, I sought Dr. Herrick and obtained his consent to travel as far as El Paso, and points through Mexico and Arizona, at a salary of \$250 a month and expenses paid. I called upon the railroad authorities, explained to them the situation, and obtained every facility the railroad could offer to make the inspection complete. The Governor of the State at once consented to place \$1,000 at the service of the Board, out of the Contagious Disease Fund, of which sum your Secretary drew \$500, and on the 21st of May dispatched Dr. Herrick upon his mission. I herewith submit Dr. Herrick's report, which he will write out in full for the Biennial Report this year. The expenses and salary of Dr. Herrick for one month were \$398 40, leaving at the disposal of the Board \$101 60.

The Secretary's report was received, and his action unanimously indorsed.

The Secretary then read Dr. Herrick's report, which declared that, after careful inspection, he was of the opinion that although smallpox was undoubtedly present in Mexico and the valley of the Rio Grande, it did not immediately threaten California; but believing that it was epidemic in those places visited, and most likely to become epidemic when the

cold weather set in, California should have an Inspector constantly on the watch against the extension of the disease.

Dr. Herrick's report was received and accepted.

In view of the conclusion of the report, Dr. Cluness moved, and Dr. C. A. Ruggles seconded the motion, that it is the sense of this Board that a Government Inspector should be permanently located in the Rio Grande Valley, in the Territories of Arizona and New Mexico, for the protection of California from contagious and infectious diseases, and that Surgeon-General Hamilton be requested to make such appointment, at the expense of the National Government, which was unanimously carried, and the Secretary instructed to write Surgeon Hamilton without delay.

The Secretary reported progress in the codification of the health laws, but owing to the increased correspondence of the Board, which occupied his time, he would be unable to get them ready for incorporation in the Biennial Report without some clerical assistance.

On motion, the Secretary was authorized to employ the necessary assistance, in order to have the laws published in the Biennial Report.

In view of the increased correspondence of the Board, Dr. Cluness moved, which was seconded by Dr. Briceland, that the Secretary be authorized to purchase, for the use of the Board, a Remington or other first-class type-writer, which was carried.

Dr. Orme reported progress with his paper on leprosy for the Biennial Report, for which he had obtained some illustrative photographic views, but did not feel justified in going to the expense of having them lithographed for publication.

On motion of Dr. Cluness, seconded by Dr. Briceland, this Board authorized Dr. Orme to have his paper illustrated at the expense of the Board.

After discussion of various matters upon sanitation, there being no further business, upon motion, the meeting adjourned.

G. G. TYRRELL,
Secretary.

THE REGULAR MEETING OF THE STATE BOARD OF HEALTH

Was held in the office of the Secretary, October 11, 1890, at the usual hour.

Present—Dr. H. S. Orme, President; Dr. G. G. Tyrrell, Secretary; Dr. J. M. Briceland and Dr. C. A. Ruggles.

The minutes of the last meeting were read and approved.

The Secretary presented the following communication from the Stockton "Daily Republican:"

To the President and Members of the State Board of Health, Sacramento, California:

GENTLEMEN: The subscribers, publishers of the Stockton "Daily Republican," desire handling in the columns of their paper the live subjects of the day. In that connection they are pleased to say to your honorable body, and its members individually, that if you desire to furnish an article, or a series of articles, at least once a month, on health and its conditions on the Pacific Coast, or any other subject-matter pertinent to the knowledge and labors of your Board, which, in your judgment, would be of interest to the general public, the "Republican" will be pleased to publish it. Desiring a favorable reply, we are,

Your very obedient servants,

DORMER & RUGGLES,
Proprietors Stockton "Daily Republican."

It was moved by Dr. Briceland, and seconded by Dr. Tyrrell, that the communication be placed on file, its invitation be accepted, and that the thanks of the Board be returned to the gentlemen, through the Secretary, which was unanimously carried.

The following communication was received from Surgeon-General Hamilton.

TREASURY DEPARTMENT,
OFFICE OF THE SUPERVISING-GENERAL U. S. MARINE HOSPITAL SERVICE,
WASHINGTON, D. C., September 13, 1890.

Dr. G. G. TYRRELL, Secretary State Board of Health, Sacramento, California:

SIR: I have respectfully to acknowledge the receipt, August 1st, of your letter containing a resolution of the State Board of Health of California, to the effect that a Government Inspector should be permanently located in the valley of the Rio Grande, in the Territories of Arizona and New Mexico, for the protection of California from smallpox and other infectious diseases, and that the appointment of said Inspector be requested of the Surgeon-General, Marine Hospital Service, the expense to be borne by the National Government. In the absence of Surgeon-General Hamilton, and because the request is for a permanent appointment, I have deferred taking action in the matter, but in the meantime have made inquiries concerning the smallpox in Mexican territory adjoining that of the United States, and in the valley of the Rio Grande. The whole matter will be brought to the attention of Surgeon-General Hamilton on his return from a tour of duty in Europe the present month.

By order of the Supervising Surgeon-General, Marine Hospital Service.

Respectfully yours,

WALTER WYMAN,
Surgeon M. H. S.

On motion, the communication was placed on file for further action.

A communication from Dr. Bailey, of Santa Ana, was read, complaining of the difficulty he had in having the health laws strictly obeyed, and asking some questions relating thereto. The Secretary read his reply thereto, which, on motion, was approved and the communication ordered on file.

The Secretary presented a manuscript copy of the health laws and ordinances as compiled by Dr. S. S. Herrick, and moved that the Board allow him a sufficient compensation for his labor.

It was, on motion of Dr. Ruggles:

Resolved, That the matter of compensation to Dr. Herrick be referred to a full meeting of the Board.

Carried.

Dr. Orme moved that the Secretary be requested to communicate with Dr. D. E. Salmon regarding the advisability of establishing a Board of the Bureau of Animal Industry upon this coast, for the purpose of considering the animal diseases prevalent in California, and adopting means for their suppression.

On motion of Dr. Briceland, seconded by Dr. Ruggles, the subject-matter was deferred until a fuller meeting of the Board was obtained.

In consideration of the various subjects which require the deliberation of a full Board, Dr. Briceland moved that when we adjourn we adjourn to meet in San Francisco on Monday evening at 8 o'clock, and the Secretary be requested to notify all the members of the San Francisco City Board of Health, and Health Officer, to meet with us in joint session for discussion on quarantine matters, legislation, and other subjects now pressing upon us, which was unanimously carried.

The Secretary reported progress with his Biennial Report, and expected to have it all in the printer's hands in a day or two.

On motion of Dr. Orme, the Secretary was requested to have two thousand copies of the report printed for general distribution.

There being no further business, the Board adjourned till Monday evening next.

G. G. TYRRELL, M.D.,
Secretary.

ADJOURNED MEETING OF THE STATE BOARD OF HEALTH

Was held in San Francisco, in the office of Dr. James Simpson, October 13, 1890.

Present—Dr. H. S. Orme, Dr. R. B. Cole, Dr. C. A. Ruggles, Dr. J. M. Briceland, Dr. G. G. Tyrrell, members of the State Board; Dr. Keeney, Health Officer of San Francisco, and Dr. Le Tourneux, Dr. Davidson, Dr. Fiske, Dr. McQuesten, members of the San Francisco Board of Health, by invitation.

The conjoined Boards met to discuss quarantine matters, as a precautionary measure against cholera.

Dr. Ruggles moved that the State Board should approve the action of the local Board in declaring Yokohama an infected port, and referred to Dr. Rucker, of Stockton, and others who have spoken slightly of this action, as quite underestimating its importance. This brought out a long and very interesting discussion of the subject of Asiatic cholera.

Dr. Le Tourneux said if anything, still greater precautions are necessary, as from latest accounts four fifths of the Chinese and Japanese attacked by the disease have died from it. San Francisco has never had a serious epidemic of cholera, and her location is such as not to favor the propagation of the disease. The duty of the Boards, however, extends to the country at large, as this city is the great gate through which orientals travel, and hence oriental infection would pass.

Dr. Cole said that unless something should be done the disease would make its appearance here, and having seen five thousand cases, he knows what a terrible calamity it is. The quarantine station, he said, is now so far advanced that a ship can be fumigated in from twenty-four to forty-eight hours, and the city can thus be protected. The apparatus, however, for disinfecting cargoes and baggage is not completed, but this, too, will be ready in from two to three weeks. In speaking of his experience with cholera, the doctor referred to a regiment which, under General (then Lieutenant) Grant, crossed the Isthmus of Panama in 1852, and of eight hundred soldiers but three hundred reached this city, the other five hundred having died of cholera on the way. Following in the strain of Dr. Le Tourneux, he said that the winds which blow across the San Francisco peninsula do not favor a spread of cholera, and that it thrives best in hot and damp atmospheres.

The motion of Dr. Ruggles, approving the efforts of the local Board, prevailed, and it was decided to visit the quarantine station on Sunday next with the express purpose, as Dr. Cole stated, of facilitating the completion of arrangements there, so that it may be speedily put in readiness to meet any exigency which may arrive.

The subject of the health of San Francisco was briefly discussed, and the action of the local Board, recommending the thorough flushing of

the sewers, was approved. The subject of quarantine was temporarily revived by Dr. Ruggles, and the Secretary was instructed to communicate with Surgeon-General John B. Hamilton, of Washington, asking as to the status of the quarantine station to be placed at San Diego, as provided by the Act of Congress.

Dr. H. M. Fiske then called the attention of the joint Boards to the growth of leprosy among white people in this State, and pointed out the necessity of a State hospital. He said that there were nine cases in this city, and the man who is most afflicted, a native of Massachusetts, has never been outside of the United States. Absolute isolation is essential to the prevention of a spread of the disease, and therefore a State Lazaretto, under the control of the State Board of Health, is imperative.

Other members of both Boards corroborated what Dr. Fiske said about the prevalence of leprosy.

The latter then moved that the State Board take cognizance of the need of a leper hospital, and recommended that measures be taken for introducing a bill in the Legislature, appropriating a suitable sum for the purchase of a site, and the erection of a suitable building.

Dr. Le Tourneux seconded the motion, and it was unanimously carried.

The fact that there is but one Market Inspector in this city was the next matter considered, and the risk from infected foods and tainted meats being sold and consumed was very clearly defined.

Dr. Cole then moved that a committee of five should be appointed to consider this and other matters, including the appointment of a State Veterinary Inspector. The motion was carried, and a rider, to the effect that the committee on legislation should report on October 27th, also prevailed.

President Orme then appointed the committee as follows: For the State, Drs. Simpson and Cole, and for the city and county, Drs. Fiske, Le Tourneux, and Davidson.

The visiting Board having retired, the subject of compensation to Dr. S. S. Herrick, for his labor in compiling the health laws of the State, was considered, and on motion, it was unanimously agreed to allow him the sum of \$75.

Meeting adjourned.

G. G. TYRRELL,
Secretary.

ADJOURNED MEETING OF THE STATE BOARD OF HEALTH

Was held in San Francisco October 18th, for the purpose of visiting and inspecting the new quarantine grounds and station at Angel Cove.

The following gentlemen formed the inspecting party: Drs. H. S. Orme, of Los Angeles, Charles Ruggles, of Stockton, R. Beverly Cole, of San Francisco, and G. G. Tyrrell, all of the State Board of Health; Drs. McQuesten, Fiske, Le Tourneux, and Davidson, of the San Francisco Board of Health; John Hoesch, Quarantine Officer Lawler, Health Officer Keeney, Dr. Bailhache, Dr. J. C. Tucker, of the United States Pension Board; Dr. William Martin, U. S. N.; Dr. Yeamans, City Physician; Dr. Sternberg, U. S. A., and Drs. Donnelly, Herrick, and Mackintosh.

The trip over was delightful. Arriving at the Cove the party was received by Colonel Bridges, who explained the plan of the station and escorted the visitors through the various buildings, nearly all of which are completed. At the wharf, where it is said two ocean steamers may be accommodated should occasion require, the concrete foundations are being laid on which will be placed the three large disinfecting boilers already described in the "Chronicle." The boilers are now on the wharf. The nearest building to the wharf is that known as the "barracks," where passengers of quarantined steamers will be accommodated during the disinfection of vessels and their cargoes. The house is much more comfortable than the name may imply. It has a frontage of 170 feet and a depth of 70 feet, and will be so fitted that none of the passengers who may be detained there will have cause for complaint.

Almost opposite the "barracks," on the side of the horseshoe which forms the pretty little cove, is the lazaretto where patients will be treated. It will accommodate about fifty patients. Joining it is a building in which will be located the dispensary and quarters of the nurses and attendants. Upon the hillside, some distance from the shore, are two buildings in which will be the quarters of the physicians and medical staff, the officers of the station, and the home of the Surgeon-in-Chief, who, it is said, will be Dr. Macintosh.

The visiting physicians inspected them, and expressed themselves as highly pleased with the plans of the station and the manner in which they have been carried out. They also paid particular attention to the water supply, which is obtained from a spring. The reservoir adjoining the spring holds about twenty thousand gallons. From it water is pumped to five tanks with a combined capacity of thirty-five thousand gallons. The flow from the spring is so strong and constant that the two pumps in the engine house working together for eight hours have not emptied the reservoir.

After lunching in the old ranch house on the hillside where Colonel Bridges has his quarters, the physicians discussed the station, its condition and its needs at length. On motion of Dr. Cole, it was decided to be the consensus of opinion of the gentlemen present that, taking into consideration the topography of the site and its adjacency to a swift current, the suggestion of Dr. Bailhache, to have the offal from the station carried to the sea in pipes, is the most salutary and economical.

Dr. Bailhache explained that the offal would be disinfected before it was sent into the bay. The current in Raccoon Straits, one thousand feet from the station, is one of the strongest in the bay.

It was also resolved by the visiting physicians that the station and the site were all that could be desired, and that the Government officials in charge, and Colonel Bridges, the constructing engineer, should receive the greatest approbation for their work.

Dr. Cole called attention to the danger of infection from vessels coming from Chinese ports, and moved that a presentation of that fact be made to the Federal Government, with the request that the station be completed and opened for patients as soon as possible.

The motion was carried, and Drs. Cole, Ruggles, and McQuesten were appointed a committee to memorialize the Government.

Speaking on this question, Dr. Ruggles said he was assured that President Harrison would do everything possible to advance the station, as

he knew from a conversation he had had with him that the President had the interest of the coast at heart.

It was said also that many improvements would be introduced at the station not known at others, as Surgeon-General Hamilton had declared it his intention to make the station the model one of the country.

A portion of the party went around part of the island in Colonel Bridges' steam launch, and upon their return expressed their great delight at the site and all its surroundings.

The party returned to this city at 5 o'clock. On the homeward trip Lieutenant Runcie, U. S. A., representing General Gibbons, the "McDowell's" Captain, and Messrs. Bailhache and Bridges, were again thanked for having afforded the occasion for the enjoyable excursion.

The State Board then adjourned to meet in San Francisco when called upon by the legislative committee.

G. G. TYRRELL,
Secretary.

ADJOURNED MEETING OF THE STATE BOARD OF HEALTH

Was held in San Francisco December 29, 1890, to take into consideration, with the Legislative Committee of the San Francisco City Board of Health, what legal changes are necessary in our present health laws, and what additions thereto are absolutely necessary for the welfare of the State.

Present—Drs. Simpson, Cole, Ruggles, and Tyrrell, of the State Board, Drs. Le Tourneux and Davidson, of the City Board of Health, and Dr. S. S. Herrick, of San Francisco, by invitation.

Dr. Orme, the President, being unavoidably absent, Dr. R. Beverly Cole was unanimously voted to the Chair.

Dr. Tyrrell stated that some of our health laws imperatively demanded amendment to make them effective, and proposed submitting to the Legislature an Act to amend Section 3064 of the Political Code, whereby the words "eighteen hundred and eighty-seven" will be changed to "eighteen hundred and ninety-one," and thus remove the objection to it which now renders it legally inoperative. He also proposed to reintroduce the Act amending Sections 3077, 3078, 3080, and 3082 of the Political Code giving compensation for the filing of deaths, births, and marriages; and also an amendment to Sections 337 and 378 of the Penal Code, substituting the word "knowingly" for "willfully." These are all the amendments he proposed asking for.

It was also proposed to introduce an Act appointing a State Sanitary Inspector; also an Act appointing a State Veterinary Surgeon; also an Act to establish a State Hospital for Lepers; also an Act to replenish our Contagious Disease Fund; also to place \$5,000 on the apportionment bill for the State Analyst, and to amend the Act establishing a State Board of Health by amending a section giving its members \$10 a day, in addition to their traveling expenses, when on duty for the State.

Dr. S. S. Herrick read a communication from Dr. H. S. Orme, in which the following amendments were considered: Chapter 24, 1889, relative to vaccination, has no penal clause. Section 377, Penal Code, was amended in 1889, so as to restrict its application to violation of the Act relating to registration of deaths and disposal of dead bodies. Its full

application should be restored, so as to reach violations of all sanitary laws.

The execution of the Act of 1889, relating to the sanitary condition of factories, shops, etc., was placed in the hands of the Commissioner of Bureau of Labor Statistics, but no extra funds or employes were provided for. Its execution should be vested in local health authorities.

A new section (2984) should be added to the Political Code, providing for a State Sanitary Inspector; also, another (2985) providing for a State Veterinarian.

A general Act is needed empowering all cities having Boards of Health or Health Officers, and a population of not less than five thousand, to have one Health Inspector; cities having a population of not less than thirty thousand, to have one Health Inspector and one Market Inspector; cities of more than thirty thousand, to have one Health Inspector for every thirty thousand inhabitants, and one for the residual fraction above one third of that number, and one Market Inspector for every sixty thousand inhabitants, and one for the residual fraction above one third of said number.

An Act is needed to establish a State Leper Hospital; the site to be selected and buildings erected under the advice and supervision of the State Board of Health; the Medical Officer and employes to be chosen by said Board; annual expenses to be provided by the State, but every county to be charged pro rata with the expenses of patients sent to the hospital.

These several suggestions having been discussed by the members present, it was agreed, at the suggestion of Dr. Ruggles, that a penal clause be added to the Vaccination Act, by making a disregard of the law sufficient cause for deprivation of the school appropriation for that district so long as disobedience is continued.

It was resolved to allow the sanitary condition of factories to continue in the hands of the Labor Bureau until a more convenient season for taking it up.

It was also agreed that the matter of a State Veterinarian be referred to the Veterinary Association for action.

The Sanitary Inspector was agreed upon. The Inspector bill was modified so as to omit the clause of five thousand, and commence with cities of ten thousand or more inhabitants. It was also proposed that we ask for \$10,000 for a leper hospital.

Dr. Cole thought we had no right to ask for \$5,000 for the State Analyst, as the mineral waters of the State belong to individuals, and the State has no authority to use its funds for the benefit of individual owners.

After some further discussion on ways and means, the meeting, on motion, adjourned.

G. G. TYRRELL,
Secretary.

THE REGULAR QUARTERLY MEETING OF THE STATE BOARD OF HEALTH

Was held in the office of the Secretary, January 13, 1891, at the usual hour. Present—Dr. H. S. Orme, President; G. G. Tyrrell, Secretary; Dr. J. M. Briceland, Dr. C. A. Ruggles, Dr. W. R. Cluness, members, and Dr. S. S. Herrick, by invitation.

The minutes of the last meeting having been read and approved, the Secretary read a telegram from Surgeon-General Hamilton, relating to the quarantine in San Diego, as follows:

WASHINGTON, D. C., October 15, 1890.

Dr. G. G. TYRRELL, *Secretary State Board of Health, Sacramento, Cal.*:

Time thus far has been consumed in getting site, several having been selected and possession refused. Good site finally purchased, and plans for buildings are now in preparation.

J. B. HAMILTON,
Surgeon-General.

A reply was sent by Dr. C. A. Ruggles to a communication addressed to Surgeon-General Hamilton, by the committee appointed for that purpose, at the meeting of the conjoined Boards of Health, held in San Francisco, October 18th, relative to finishing the quarantine station at Hospital Cove, Angel Island, stating:

"That an additional appropriation had been asked of Congress for the building of the boarding steamer, and the completion of the building omitted from the plan on account of lack of appropriations."

It was moved by Dr. Ruggles that the subscription of the Board to "Sanitary Record" be renewed and the bill paid. It was also moved that the bill for subscription for "Sanitarian" be paid, and our subscription for one copy be renewed.

A communication from the Lorin Sanitary District, and the action of the Secretary regarding the disposition of the matter, was approved.

A communication from E. O'Brien, Health Officer at Merced, stating that a leper was discovered on Merced River and asking how he could dispose of him. The Secretary replied that the county would have to care for him, as the State had made no provisions for such cases, as the county was usually responsible for his isolation and safe keeping.

On motion, the reply of the Secretary was indorsed and his action approved.

On motion of Dr. J. M. Briceland, seconded by Dr. Cluness, the Secretary was instructed to draw up a bill to procure a fund for prevention of contagious and infectious diseases, which is necessary for our protection.

On motion of Dr. Briceland, seconded by Dr. Cluness, the Secretary was instructed to prepare a bill for the erection of a leper hospital and the purchase of a site.

On motion of Dr. Cluness, the Secretary was instructed to urge the passage of the bill appointing a State Sanitary Inspector.

Dr. Cluness moved that an Act be prepared to amend Section 378 of the Penal Code, by inserting the word "knowingly" for "willfully," which was carried. Also, to amend Section 3064 and Section 3077 of the Political Code, which were carried.

The Secretary was also instructed to amend the Act organizing a State Board of Health, by adding a section giving the members \$10 a day while engaged in the duties of the Board.

On motion of Dr. Orme (Cluness in the chair), seconded by Dr. Briceland, the following resolution was adopted:

Resolved, That the Secretary of this Board be instructed to communicate with Hon. D. E. Salmon, Chief of United States Bureau of Animal Industry, and with our Senators and Representatives in Congress, to the end that a branch of said Bureau may be established in California, inasmuch as no such branch now exists west of the Rocky Mountains.

Which was unanimously carried.

There being no further business, on motion of Dr. Briceland, the meeting adjourned.

G. G. TYRRELL,
Secretary.

THE REGULAR QUARTERLY MEETING OF THE STATE BOARD OF HEALTH

Was held in the office of the Secretary on April 20, 1891.

Present—Dr. W. R. Cluness, Dr. C. A. Ruggles, Dr. J. M. Briceland, Dr. G. G. Tyrrell, Dr. H. S. Orme, Dr. R. B. Cole; and by invitation, Dr. J. R. Laine, Dr. P. C. Remondino, Dr. C. W. Nutting, and Dr. W. G. Cochran.

The minutes of the last meeting having been read and approved, the Secretary read the following communication from the Bureau of Animal Industry in reply to the communication requesting the organization of a branch of the Bureau west of the Rocky Mountains:

WASHINGTON, D. C., March 11, 1891,

Dr. G. G. TYRRELL, *Secretary State Board of Health, Sacramento, Cal.:*

DEAR SIR: I am in receipt of your favor of the 2d instant, transmitting resolution adopted by your Board, requesting you to communicate with me with the object of having a branch of this Bureau established in California. In reference to this I would say that the work of this Bureau is carried on by stationing inspectors or agents in localities where any line of work which we have in charge needs to be carried on. As we have a number of different lines of work, such as the scientific investigation of diseases, the eradication of pleuro-pneumonia, the inspection of animals and meats for export, etc., I would be glad to hear further from you as to the line of work that your Board thinks the Bureau should undertake in California.

Very respectfully,

D. E. SALMON,
Chief of Bureau.

It was moved that the communication be received and the matter be referred to the incoming Board. Carried.

The following communication was read by the Secretary and ordered placed on file:

OFFICE OF THE IOWA STATE BOARD OF HEALTH, }
DES MOINES, April 1, 1891. }

To all Undertakers and Railroad Companies:

By reason of the frequent shipment of the bodies of persons dead from diphtheria, under the statement that the cause of death was "heart failure," or some other sequelæ of that disease, and non-contagious, thereby greatly endangering human life, at a meeting of the Iowa State Board of Health, held Thursday, November 20, 1890, it was ordered that the transportation of the bodies of persons dead from diphtheria be prohibited in this State, and that the word "diphtheria" be stricken out from Rule 2, of the Rules and Regulations for the Transportation of Corpses, and that the word "diphtheria" be inserted in Rule 1, after the word "smallpox." Undertakers, baggagemen, and railroad station agents are hereby notified to govern themselves accordingly. The following resolution was also adopted:

"Resolved, That a return of a death made by a physician giving 'heart failure' as a cause of death, shall not be deemed a sufficient return, and such must be returned to the physician who made it for the proper correction and definition."

J. F. KENNEDY, M.D.,
Secretary.

Dr. R. Beverly Cole then moved that the above communication from the State Board of Health of Iowa be indorsed, and trust that the incoming Board will take such steps in respect to the resolution contained therein as will do away with the vagueness of certificates of death stat-

ing the cause of death to be "heart failure," "dropsy," "fever," "child-birth," "colds," etc., which was unanimously carried.

An invitation to appoint delegates to the National Conference of State Boards of Health was received and referred to the new Board for action. Same disposition was made of invitation to attend International Congress of Hygiene.

The attention of the Board having been called to a quack advertisement, as follows:

The State Board of Health, appointed by the Governor of California (and composed of physicians) to see that none practice medicine or surgery in this State without they are perfectly qualified to do so, have examined the diplomas of the New York specialists and declare them correct, and authorize them to practice medicine and surgery in California, and they hold certificates from the State Board of Health of California to that effect.

It was moved by Dr. Cluness, and seconded by Dr. Cole, and carried, that the Secretary be instructed to contradict, by telegraph to the San Diego "Union," the above untruth.

The Secretary then read the following telegram, which, having been signed by each member of the Board, was at once dispatched to San Diego, the present quarters of the "New York Specialists:"

OFFICE STATE BOARD OF HEALTH.

To San Diego "Union.:"

The statement advertised by parties calling themselves "The New York Specialists," that they hold certificates from the State Board of Health of California, entitling them to practice medicine and surgery in the State, is absolutely false, malicious, and calculated to deceive the public.

The following communication from the American Public Health Association was ordered received and placed on file:

To G. G. TYRRELL, Secretary State Board of Health, Sacramento, Cal.:

DEAR SIR: At the eighteenth annual meeting of the American Public Health Association, held at Charleston, S. C., December 16-19, 1890, the following vote was passed: Voted, to instruct the Secretary to advise each State Board of Health which has not already done so, to issue directions to all local Boards of Health and Health Officers in reference to the preparation and proper use of disinfectants, basing such directions upon the reports of the Committee on Disinfectants of the Association.

Respectfully submitted.

IRVING A. WATSON,
Secretary.

The following gentlemen having been appointed by Governor Markham as members of the State Board of Health, presented their credentials, which were received, and the members welcomed to their seats by President H. S. Orme: Dr. C. W. Nutting, of Etna Mills, vice Briceland, term expired; Dr. P. C. Remondino, of San Diego, vice J. M. Simpson, term expired; Dr. W. R. Cluness, vice self, unexpired term; Dr. C. A. Ruggles, vice self, term expired; Dr. J. R. Laine, vice Tyrrell, term expired; Dr. W. G. Cochran, of Los Angeles, vice R. B. Cole, term expired.

It was moved and seconded that Dr. Tyrrell be requested to act as Secretary during the organization of the new Board. Carried.

Nominations for President being in order, Dr. Ruggles offered the name of W. G. Cochran, of Los Angeles, for that position. Nominations were closed and ballot ordered, six votes being cast. Dr. Cochran received five, and Dr. Ruggles one. Dr. Cochran, having received a majority of the votes cast, was declared duly elected President.

Nominations for Secretary being in order, Dr. Cluness was placed in

nomination by Dr. C. W. Nutting. Dr. J. R. Laine was nominated by Dr. P. C. Remondino. Ballot being ordered, six votes were cast. Dr. Cluness received one vote, and Dr. Laine received five votes. Dr. Laine having received a majority of the votes cast, was declared duly elected to the office of Secretary of the Board.

G. G. TYRRELL, M.D.,
Secretary.

THE REGULAR MEETING OF THE STATE BOARD OF HEALTH

Was held at 10 P. M., April 20, 1891.

There were present C. A. Ruggles, of Stockton; W. G. Cochran, of Los Angeles; P. C. Remondino, of San Diego; C. W. Nutting, of Etna Mills, and W. R. Cluness and J. R. Laine, of Sacramento.

The meeting was called to order by Dr. C. A. Ruggles, who appointed Dr. G. G. Tyrrell, the late Secretary, to act as Temporary Secretary.

The first business in order being the election of a President, Dr. C. A. Ruggles placed Dr. W. G. Cochran in nomination, and he was unanimously elected.

Upon taking the chair, Dr. Cochran declared the next business in order to be the election of a Permanent Secretary. Dr. C. W. Nutting placed Dr. W. R. Cluness in nomination, and Dr. P. C. Remondino nominated Dr. J. R. Laine. A canvass of the ballots showed six votes to have been cast, one of which was in favor of Dr. Cluness and five in favor of Dr. J. R. Laine. The President thereupon declared Dr. Laine duly elected Permanent Secretary of the State Board of Health.

Dr. Ruggles then moved that the Secretary be instructed to obtain a correct census report of cities and towns furnishing mortuary reports, and to compute the percentage of deaths from such corrected reports. The motion was adopted, as was also the motion by Dr. Ruggles to instruct the Secretary to announce to local Boards of Health that reports giving heart failure, dropsy, colds, childbirth, and such like vague terms as causes of death in their monthly mortuary tables, will not be regarded as sufficient nor satisfactory; and that a recommendation be made that specific terms, such as are recognized in medical nomenclature, be invariably employed to designate the cause of death.

Dr. Ruggles gave notice that he would bring up Section 2979 of the Political Code for discussion at the next meeting, so as to get a better understanding as to the legal rights and status of the State Board of Health with reference to the sanitary requirements of the various public institutions receiving State aid and support.

The Board then adjourned, to meet at the office of the Secretary at 9 A. M., April 22d.

J. R. LAINE,
Secretary.

AN ADJOURNED MEETING OF THE STATE BOARD OF HEALTH

Was held at 9 A. M., April 22d, at the office of the Secretary, there being present Drs. Cochran, Remondino, Nutting, Ruggles, and Laine.

The minutes of the previous meeting were read and approved. It was

ordered that the codified laws of California relating to sanitary affairs should be obtained from the State Printing Office and properly distributed.

The Board, after a further discussion of matters relating to perfecting its efficiency, adjourned until the quarterly meeting in July.

J. R. LAINE,
Secretary.

THE REGULAR QUARTERLY MEETING OF THE STATE BOARD OF HEALTH

Was held at the office of the Secretary on July 6, 1891, at 8 P. M.

There were present Drs. Cochran, Ruggles, and Laine. Communications from Drs. Remondino and Nutting were read, giving reasons for their absence.

The minutes of the last meeting were read and approved.

The resignation of Dr. Julius Rosenstirn was read and ordered placed on file.

Dr. P. C. Remondino was duly elected a delegate to represent the State Board of Health at the meeting of the American Public Health Association to be held at Kansas City, Mo., in October, 1891.

There was a lengthy and earnest discussion of various matters relating to public sanitation, after which the Board adjourned, to meet at the call of the President.

J. R. LAINE,
Secretary.

THE STATE BOARD OF HEALTH MET IN REGULAR SESSION

At 8 P. M., October 19, 1891.

Present—Drs. W. G. Cochran, C. W. Nutting, C. A. Ruggles, and J. R. Laine.

The minutes of the previous meeting were read and approved.

The Secretary, Dr. J. R. Laine, reported having made an official visit to the town of Willows, on account of an outbreak of diphtheria. This action was approved.

The matter of a change in blanks for reporting deaths and diseases was, after a lengthy discussion, left to the discretion of the Secretary.

The Board then resolved to adjourn until the next day, in order to make a sanitary survey of the Folsom State Prison, the Stockton and Napa Asylums for the Insane, the San Quentin State Prison, the State University, and the Berkeley Asylum for the Deaf, Dumb, and Blind, and to adjourn from day to day until the surveys are finished.

FOLSOM PRISON.

The State Board of Health, consisting of Drs. Cochran, Nutting, Ruggles, and Laine, met at the Folsom State Prison on October 20, 1891, to inquire into its sanitary condition.

The condition of the convicts and the ventilation of the cells and buildings were carefully inspected and found to be good. The food supplies, including vegetables and bread, were of good quality, the food well cooked, and the dining-room and kitchen were in a creditable condition.

The prison drainage is of an ancient pattern, being a sewer running the length of the building, having wooden blocks opening in the middle of the wards, with no ventilation except into the buildings.

All liquid and solid refuse passes into this drain, which discharges its contents about three hundred feet in a northerly direction into the American River.

Warden Aull explained that he had under consideration an elaborate and well-considered plan for plumbing and draining the prison, with due provisions for ventilating the sewer outside of the buildings. The plan, as shown in a diagram submitted to the Board, is suitable, and will, when completed, free the prison from all danger from sewer gases. It is ascertained upon inquiry that, notwithstanding the imperfect system of drainage now in use, no diseases traceable to this as a cause have been noted. This is doubtless due to two facts: the perfect ventilation in the roofs of the buildings, and the rapid flow of the sewage and shortness of the sewer.

The sewer empties directly into the river, with no attempt to precipitate or detain its solid contents. This state of things, if long continued, must, in no small degree, pollute the water which is used for domestic purposes by forty thousand people within a distance of twenty miles.

In view of this condition, the following preamble and resolutions were unanimously adopted and ordered placed upon the minutes:

WHEREAS, The sewage of the Folsom State Prison flows directly into the American River twenty miles above Sacramento, which city obtains its water supply for public and domestic uses at a point immediately below the confluence of that stream with the Sacramento River; therefore, be it

Resolved, That the State Board of Health advise a discontinuance of this practice as detrimental to the public health and a violation of law; be it further

Resolved, That a recommendation be made that settling or chemical precipitation tanks be constructed at the outflow of the sewer, so that nothing but water deprived of injurious qualities shall be permitted to flow into the American River, and that the solid substances be precipitated and removed, and utilized as fertilizing material on the prison farm; and be it further

Resolved, That a copy of these resolutions be transmitted to George A. Knight, the attorney for the State Board of Health, with instructions to enforce a compliance with these recommendations.

STOCKTON INSANE ASYLUM.

The State Board of Health, consisting of Drs. Cochran, Nutting, Ruggles, and Laine, met at the Stockton Asylum for Insane on October 21, 1891.

An inspection of the food supplies showed them to be of good quality. The kitchen was well furnished, but the windows and doors were unscreened and flies swarmed in myriads.

The same condition existed with reference to the bakery and dining-room for employes and the dining-room for patients.

The food was well cooked and was served in abundance. There was ample evidence that the management is kind, humane, and in a high degree creditable. The buildings are large, airy, and generally clean. The grounds are spacious, and, except in the rear of the kitchen where rags and bits of torn sacks and other refuse lay scattered around, are well kept. What meat was found in a screen meat stall was of prime quality, but the stall, notwithstanding the screen, contained many flies.

The water-closets are in detached buildings, and great efforts have been made to overcome the fatal error of locating such an institution where there is no fall for drainage. The closets are well kept and free from injurious odors.

The system of sewerage in use entails constant supervision and labor. Soil and waste pipes convey the sewage to branch sewers, converging to the main sewer, where it flows with sluggish current to a large catch-basin eighteen feet in depth. The sewers are constructed of redwood boards, and have square man-holes at about every hundred feet. In order to keep them pervious men are daily employed in floating a bit of wood, to which is attached a cord, from one man-hole to the other next below, and then dragging that section with a bundle of sacks. The last constructed building is sewered with vitrified stone pipe, ventilated by square box man-holes. The sewage flows into the box sewer, whence it is discharged into the catch-basin, where a stationary engine pumps it into raised box flumes, which convey it, diluted with artesian water, to adjacent vegetable gardens as combined irrigation and fertilizer. During the winter it continues its flow to a canal two miles distant, which leads to tide water.

So far no objection has been raised by neighbors to the use of sewage as fertilizing fluid. Neither need there be objection where such irrigation is sufficiently remote from habitations that it cannot offend the senses. One flume, however, carries sewage several hundred feet northerly and then westerly to within one hundred feet of the southern extremity of the building occupied by female patients, where it is used to irrigate a plat of alfalfa. Along its entire length it leaks badly, the fluid spreading out on either side of the flume, offensive to both sight and smell.

Believing that the maintenance of this raised flume and the irrigation with sewage in such proximity to the structure occupied by the female patients is, or might be, injurious, the Board unanimously adopted the following resolution:

Resolved, That the Secretary of the State Board of Health is hereby instructed to communicate with the Superintendent of the Stockton Asylum for the Insane, calling attention to an open flume carrying sewage to an alfalfa patch on the south side of the building occupied by female patients, and recommending a discontinuance of this practice and the removal of the flume; substituting therefor an iron or vitrified stone pipe sunk in the ground; and that no surface irrigation be practiced in close proximity to the buildings occupied as habitations, except with water uncontaminated with sewage.

NAPA INSANE ASYLUM.

Drs. Cochran, Nutting, Ruggles, and Laine met at the Napa Asylum for the Insane on October 22, 1891, for the purpose of making a sanitary survey.

The kitchen, dining-rooms, and bakery were in excellent condition. The food supplies were of good quality, and appeared to be served in a palatable condition and in abundance. The fresh meats are subjected to refrigeration four days before using.

The site is admirably chosen for such an institution. The architectural proportions of the building, their external beauty of design and finish, harmonize with the beautiful grounds, which are adorned with choice shrubbery, and grace the broad avenue leading to the entrance of the buildings.

The asylum is overcrowded. The system of sewers for the institution is of vitrified stone pipe, laid in the basement from each water-closet to the central sewer, which leads to an open field remote from the building.

The pipes underneath the buildings often clog and burst, requiring frequent disturbance, which, in a degree, vitiates the atmosphere of the

basement. This would not be serious, inasmuch as it is freely ventilated, were it not that the heating apparatus is situated here, and the air used for heating the building obtained from the basement, and not from where it should be—the open air.

These faults are susceptible of removal by the single expedient of constructing water-closets and lavatories in the court, separate from the main building, but communicating with them, and abandoning all the water-closets in the main buildings. This would relieve the overcrowding by one hundred persons. By taking up the sewer and soil pipes now in the basement, and extending the main sewer in the most direct line to the new outside closets on to the smokestack of the powerhouse, the sewer would be complete. The waste pipes should be provided with a catch-basin, leaving an air space. That portion of the sewer which passes underneath the building should be of iron. The basement floor should be bituminized. These improvements would relieve the plethora, purify the basement, furnish improved closets, free the dormitories from sewer gases, and put a stop to the nuisance of breaking the clogged soil and sewer pipes underneath the buildings.

The Secretary was instructed to communicate with Superintendent Gardner, embodying the views of the State Board of Health, and urging that the Board of Directors for the Napa Asylum be importuned to put in execution the recommendations therein contained with the least possible delay, so that the improvements may be completed, if possible, before the rainy season sets in.

SAN QUENTIN STATE PRISON.

The State Board of Health, consisting of Drs. Cochran, Ruggles, Nutting, and Laine, met on October 23, 1891, for the purpose of inspecting the San Quentin State Prison.

The location of the prison is well chosen for drainage and salubrity. The arrangement of the buildings and their manner of construction show that they have been erected at different periods. A painful lack of harmony prevails in the appearance of the structures.

The fall for drainage is ample, and the plumbing, though not of modern construction, is nevertheless sufficient for present uses.

A water-closet in the tailor shop directly over the bakery is in bad condition, and should be speedily overhauled. The yard closet is of primitive construction, and too deep, and the building inclosing it is too low. Both could be remodeled at a trifling expense, so as to secure increased comfort and better ventilation.

The cells were clean and well ventilated, the yards were well policed, and everything about the grounds showed careful supervision. There was some objection to the wooden pails for night use in the cells, as they absorb the contents, and notwithstanding careful rinsing, are offensive to the smell. It was the opinion of the Board that they should be replaced, when convenient, with galvanized iron vessels.

A careful inspection of the food supplies was in every way favorable. The vegetables, bread, and meat were good. The food served at mid-day was well cooked and abundant. The general dining-room is, however, too dark and damp. The kitchen, though of ample dimensions for all culinary purposes, is totally unfit for the purpose. It is so dark as to require gas light at noon of a sunny day. Light comes in from

the west side only, where the sun is shut out by a four-story building. The east wall is blank, and drips with moisture, which collects in puddles on a badly-patched cement and bituminous floor, requiring constant sweeping and mopping to keep it dry. Ventilation is altogether inadequate, and the steam from the boilers condenses on the cold walls, increasing the discomforts and dismal appearance of the place.

The kitchen should be either removed to a more suitable place, or the east wall should be uncovered and pierced with windows for light and ventilation. This can be done by bulkheading ten feet of space outside of the east wall, which can then be perforated for windows. This space should be drained by a pipe running under the kitchen floor, and the floor covered with concrete.

If, in addition to these improvements, which may be deemed all that are necessary, the high building that obscures the sun on the west side were removed, the kitchen would be in a very good condition. As it now is, it is totally unfit for the purpose which it serves, and is, moreover, a disgrace to the institution.

STATE UNIVERSITY, BERKELEY.

The State Board of Health met at Berkeley, October 24, 1891. There were present Drs. Cochran, Nutting, Ruggles, and Laine.

The State University buildings were not fully inspected, owing to lack of time. Sufficient information was, however, elicited from the Secretary of the Board of Regents to determine that a deficiency of water exists, necessitating the closing of all the water-closets adjacent to the University class-rooms during a great portion of the summer months. This condition borders on the scandalous, and amounts to a positive nuisance, which should admit of no loss of time in abating.

If the University plant is inadequate to supply the requirements of the institution, enough should be purchased from neighboring water companies to supply all needs.

It is difficult to realize how there can be a valid excuse for closing the closets of the University during term, when water is obtainable by purchase. The chief institution of learning belonging to the State should not be permitted to languish from want of water. The Board of Health is not in possession of sufficient data to determine what should be done in the premises, but it does strongly advise the procurement of an ample supply of water at any cost. It is not within the province of the Board to indicate how this should be done.

DEAF, DUMB, AND BLIND ASYLUM.

This institution was found to be in such an excellent condition as to require no extended comment. The grounds are admirably kept. The buildings are imposing and spacious, and the plumbing and drainage are of a modern and approved pattern.

The Board then adjourned until evening, when it again convened at the Palace Hotel in San Francisco, to consult with George A. Knight, the attorney for the State Board of Health.

After fully considering the work that had been done, the Secretary was instructed to communicate with the management of the different institutions visited by the Board, furnishing such recommendations as

had been made, and disclaiming all intention to pass strictures upon those in authority, or to disparage the efforts of those in charge, and expressing also a full apprehension of the many obstacles in the way of placing State institutions in an ideal condition.

The Board then adjourned until the next quarterly meeting in January, 1892.

J. R. LAINE,
Secretary.

THE REGULAR QUARTERLY MEETING OF THE STATE BOARD OF HEALTH

Was held at the office of the Secretary on January 18, 1892, at 8 P. M.

There were present Drs. Cochran, Ruggles, and Laine. Letters were read from Drs. Nutting and Remondino, stating reasons for non-attendance, and promising to be present at the next regular meeting in April.

The minutes of the last meeting were read and approved.

Communications were read from Benjamin Lee, Secretary Pennsylvania State Board of Health, which were ordered placed on file, to be answered by the Secretary at his convenience.

A letter from H. N. Rucker, Medical Superintendent of the Stockton Insane Asylum, was ordered placed on file.

The Secretary was instructed to ascertain and report at the next regular meeting what has been done toward a compliance with the recommendations made by the State Board to the different public institutions with reference to their sanitary condition.

The Board then adjourned to meet in April.

J. R. LAINE,
Secretary.

THE REGULAR QUARTERLY MEETING OF THE STATE BOARD OF HEALTH

Was held at the office of the Secretary at 8 A. M., April 18, 1892.

There were present Drs. C. A. Ruggles and J. R. Laine.

There being no quorum, the meeting adjourned to convene at the call of the President at San Francisco the next day.

J. R. LAINE,
Secretary.

THE STATE BOARD OF HEALTH MET IN REGULAR ADJOURNED SESSION

At the Palace Hotel at 9 A. M., April 19, 1892.

There were present Drs. W. G. Cochran, P. C. Remondino, W. R. Cluness, C. A. Ruggles, C. W. Nutting, and J. R. Laine.

The minutes of the previous meeting were read and approved, also those of the adjourned meeting of the 18th.

The President stated that the purpose of holding a meeting in San Francisco was to hold a conference with the San Francisco Board agreeable to a request made six months before, and to discuss matters relating to coming legislation, which should be prepared for the session of the Legislature. It was also desirable, after meeting the San Francisco Board, to visit, if possible, the quarantine station on Angel Island in

San Francisco Harbor; also the Insane Asylum at Agnews and the State Normal School at San José.

The Secretary was instructed to confer with the San Francisco Board of Health and arrange for the meeting of the two Boards, and report at 9 A. M. Wednesday, April 20th.

The Board then adjourned until the next day.

J. R. LAINE,
Secretary.

THE STATE BOARD OF HEALTH MET IN REGULAR ADJOURNED SESSION

At the Palace Hotel, at 9 A. M. April 20, 1892.

There were present Drs. Cochran, Ruggles, Nutting, Remondino, and Laine.

The Secretary reported having made all possible efforts to have an early conference with the San Francisco Board of Health, but that the earliest date obtainable was 9 A. M. April 21st, at the City Health Office, in the City Hall.

The President expressed regrets that the meeting could not be held sooner, as the hour and date fixed would not admit of the Board leaving the city to complete the sanitary survey of the State buildings until after Thursday.

The Board then adjourned to meet at the San Francisco Health Office at 9 A. M. April 21, 1892.

J. R. LAINE,
Secretary.

THE STATE BOARD OF HEALTH MET IN REGULAR ADJOURNED SESSION

At the San Francisco Health Office at 9 A. M., April 21, 1892.

There were present Drs. Cochran, Ruggles, and Laine, of the State Board, Mayor Sanderson, Drs. M. Regensburger, S. F. Long, Geo. J. Bucknall, Health Officer James Keeney, Quarantine Officer Lawler, and attachés of the local health office.

Mayor Sanderson invited the State Board to address the conference on any subject that should properly come before the joint bodies.

President Cochran stated that in addition to the natural desire to meet, officially as well as personally, the members of the local Board, there were important subjects to be considered with reference to presenting bills relating to sanitary affairs to the next Legislature. If it should be determined to attempt any advancement in sanitary legislation, the measures proposed should be well considered, and the bills prepared in advance.

Dr. C. A. Ruggles believed that the State was in need of a hospital for lepers; that as matters now stood lepers were either allowed to remain at their homes with their families, or they are maintained in county pesthouses. He favored legislation which will provide a suitable retreat for lepers, to be maintained by the State.

Dr. Regensburger also favored such a course, but would go further, by providing also an asylum for incurables of all kinds. He believed that San Francisco received an undue proportion of incurables of the indigent class, so much, in fact, as to tax seriously the capacity of available accommodations for their comfort.

On motion of Dr. Cochran, the Mayor was authorized to appoint a committee of five, three from the State Board and two from the San Francisco Board, to confer with Geo. A. Knight, the attorney for the two Boards, and prepare a bill meeting the necessities of the situation, and cause the same to be introduced in the Legislature, and to use all honorable means in furthering its passage, until it becomes a law.

The Mayor appointed Drs. Cochran, Ruggles, and Laine, of the State Board, and Regensburger and Long of the San Francisco Board, to meet at the call of the Chairman.

Dr. Regensburger introduced a resolution disapproving the custom of baring the head at funerals, and cited a number of casualties resulting from the practice during the last two winters. The resolution was adopted, and the matter was referred to the Secretary of the State Board for further action.

The State Board, accompanied by P. H. Bailhache, Surgeon Marine Hospital Service, and Dr. Lawler, Quarantine Officer, boarded the Government tug-boat at the Clay Street Wharf and steamed around Angel Island to the quarantine station, on the north side of the island, where a landing was made at the wharf.

The Board, after a view of the premises from the wharf, returned to San Francisco and adjourned until 9 A. M. the next day.

J. R. LAINE,
Secretary.

THE STATE BOARD OF HEALTH MET IN REGULAR ADJOURNED SESSION

At the Palace Hotel at 9 A. M., April 22, 1892.

Present—Drs. Cochran, Ruggles, Remondino, Nutting, and Laine.

The President stated that owing to the unexpected detention of the Board at San Francisco, it would be impossible to complete the sanitary survey of State institutions during the present session. Drs. Laine and Ruggles were thereupon instructed to visit Agnews Asylum and the San José Normal School, if possible, before the close of the fiscal year. Dr. Cochran then presented the following communication, which was read by the Secretary:

SAN FRANCISCO, April 22, 1892.

To the members of the State Board of Health:

I desire to present my resignation as President of this Board, to take effect June 30, 1892, next, the close of the fiscal year of the Board.

I ask that my resignation be accepted and my successor elected at this meeting.

There are several reasons why I resign; one of which is, I feel that being President of this Board is a compliment that should be passed around among the members; another is, the distance from Los Angeles to the place of meeting. As long as I am President I feel under the greatest obligation to attend all of the meetings of the Board, and this is at times very inconvenient.

Permit me to express to each member my gratitude and appreciation for the honor you did me in electing me your President; and more especially, for the constant and uniform courtesy at all times extended to me by each one of you.

Very respectfully,

W. G. COCHRAN.

Dr. Ruggles begged Dr. Cochran to withdraw his resignation.

Dr. Cochran replied that he could not consistently do so, inasmuch as there were others who should share the honor of being President of the Board. Upon the urgent request of Dr. Ruggles, the Board refused

to accept Dr. Cochran's resignation, but his communication was ordered spread upon the minutes of the Board.

The Board then adjourned to meet at Los Angeles in May or June, at the call of the President.

J. R. LAINE,
Secretary.

THE STATE BOARD OF HEALTH MET IN REGULAR ADJOURNED SESSION

At 9 A. M., May 16, 1892, at Los Angeles.

Present—Drs. Cochran, Remondino, Ruggles, and Laine.

A letter was read from Dr. Nutting expressing regrets at his compulsory absence.

The Board then decided to make a sanitary survey of the State Reform School at Whittier, and of the State Normal School at Los Angeles.

THE REFORM SCHOOL AT WHITTIER.

This place was found to be admirably situated for the purpose for which it is intended. The grounds are sufficiently elevated to furnish ample fall for the drainage, which is all received in one common receptacle a few hundred feet west of the main building, and strained. The solid matter is utilized on the farm as a fertilizing agent, and the water deprived of its solids is used on the farm for irrigation purposes.

The lavatories and closets were in perfect order, and there was an abundance of excellent water for all necessary purposes. The accommodations for girls were altogether inadequate, but the dormitories for boys were quite sufficient for the number there at the time. They were clean, well aired, and there was sufficient bedding of a good quality.

The food placed on the tables was of good quality, ample in quantity, and well cooked. The supplies found in the store-room were of good quality. The butter and fresh meats were sweet and fresh. The whole place had an air of neatness. The Board were deeply impressed with the observable results of the State's endeavor to care for the youths attending the school. It was at once apparent that the influences bearing upon the boys were in many ways beneficial. Their appearance, instead of being sullen and depressed, was contented and cheerful. Seen at their studies, there was little to distinguish them from classes in boys' schools in other places.

In the paint shop, shoe shop, tailor shop, blacksmith shop, cabinet shop, on the farm, and about the gardens, there was the same cheerful disposition and willingness to perform the duties assigned to each, with little or no obtrusive supervision. The boys seemed to be put on their honor in the matter of behavior and general deportment.

The afternoon drill was performed with an alert precision of movement that would excite the admiration of the most enthusiastic National Guardsman. There was a noticeable absence of any suggestion of a reformatory. No locks or bars; no guards, and none needed. The school needs but the removal of the word "Reform" in its official appellation to make it an ideal as well as a model "State School." It might, with great propriety, be called the "State School," so that when a youth returns to private life he will not be handicapped by the stigma of having been an inmate of a reformatory institution. These youths are

congregated here to be trained into American citizens, and not to be punished for delinquencies, the scope and enormity of which their immaturity does not admit of their comprehending. The offenses for which they are sent to the school are not frequently such as necessarily indicate precocious depravity, but are, with few exceptions, rather evidences of ignorance, parental neglect, and an unrestrained excess of youthful energy.

Keeping the pupils employed, and directing simultaneously the mental, moral, and physical energies, proves to be an effectual and, it is believed, a permanent corrective.

With time fully occupied with study and congenial labor, with plenty to eat, good beds, clean clothes, and frequent baths, life is brightened, with a prospect of an honorable future as intelligent citizens. There is none of the depravity and degradation that follows an association with criminals in houses of correction and penitentiaries.

The Board, therefore, in view of the good to be obtained from such a course, ventures upon the verge of its official province to recommend a careful scrutiny of the methods at Whittier, and their results, in the belief that such observation will not only inure to the benefit of the youths at that school, but that the example may lead to the establishment of another on a similar plan in the interior of the State, and more centrally situated.

It is believed that such a course would prove economical to the State. It certainly would be an enlargement in the humane treatment of unfortunate boys and girls, and would convert them into law-abiding people, when, if left to their deplorable resources, they must inevitably entail a great expense to the commonwealth in their future conviction for crime, and their maintenance as criminals.

The Board adjourned until 9 A. M. the following day.

J. R. LAINE,
Secretary.

THE STATE BOARD OF HEALTH MET IN REGULAR ADJOURNED SESSION

At 9 A. M., May 17, 1892.

Present—Drs. Cochran, Ruggles, Remondino, and Laine.

The Secretary was instructed to supply each member of the Board with the necessary postage and stationery.

The Board appointed Drs. Ruggles and Remondino a committee to inspect the County Hospital at San Diego. A visit was then made to the State Normal School at Los Angeles, where the sanitary condition was found to be unexceptionable.

Before adjourning the Secretary reported having caused to be printed two circulars, in a "Preventive Disease" series, one of which is addressed to the clerical profession, treating on the "Dangers of Public Funerals of those who have died from Contagious and Infectious Diseases," and another addressed to the clerical profession and officers of secret orders and beneficiary societies, on the "Dangers from the Removal of the Hat at Funerals."

The Board then adjourned until the next regular meeting, or to meet at the call of the President.

J. R. LAINE,
Secretary.

REPORT OF THE SECRETARY.

To the State Board of Health:

GENTLEMEN: The system of public hygiene in California, which comes under the police power of the State, is such that the executive administration is everywhere imposed upon the local Boards.

Sanitation, in its modern sense, is, in obedience to natural laws, a product of advanced civilization. Like civilization, it is a development of man's resources, and is, moreover, a true index of his ability to exist. A recognition of the necessity of obedience to rules that by common consent are termed "sanitary" and "hygienic," has led to the enactment of public health laws in all civilized countries. But it was reserved for the present generation to develop it to the prominence which it has now reached. By virtue of social and political organization there becomes vested in every nation, in every State, and, by delegation, to every municipality, a power to defend itself against disorder, indecency, disease, and discomfort. From its very nature such a power is incapable of precise definition or exact limitation. The police power of the State extends to all matters affecting public health and the public morals. It is not restricted to a narrow limit, but extends over a wide domain of social life. It has authority to assert that individual convenience must often yield to public convenience, and that individual profit must often be subordinated to the public good, and individual notions of what is decent and proper shall give way before the general opinion as to what is unbecoming. It emphasizes, in terms that cannot be misunderstood, that all property, of whatever nature, shall only be used by its owner in such a way as not to injure his neighbor. Not only is its exercise to be for the safety of life and property, but also in legislative discretion it must be applied to the proper rules of life, so that the good order, health, and morals of the community may be protected and lifted to a higher plane. So thoroughly is this power of the very essence of all social order, that it cannot be evaded, resigned, or relinquished. The authorities cannot give up definitively this police power. It inheres in the National Government for national purposes, in the State Government for State purposes, and when delegated to county, city, or town, for local purposes.

It might seem that a vigorous exercise of this power might result in an infringement of personal liberty; but the individual liberty which is being evolved in our history, and whose perfection must be the ideal of every lover of humanity, is a harmony between the volition of the intelligent citizen and the needful requirements of organized society. When a law satisfies the educated desires of those who obey it, there can be no infringement of individual liberty. But there are times when the strong arm of force must be invoked for the protection of society. There is sometimes found a vested interest in nuisances. The regulation of the sale of intoxicating liquors, the suppression of gambling, the establishing of quarantines, the isolation of infected persons, the removal of

slaughter-houses from within the limits of towns and cities, the regulation of building so as to conform with plumbing and fire laws, the removal of cemeteries from crowded towns, the construction of sewers and drains for homes at the expense of the owners, are all in the direction of public health and public morals, and should be urged and insisted upon, not only by the citizen, but by public opinion, pulpit, and press, aided by the constabulary force of the State.

LOCAL SANITARY REGULATION.

The larger cities of California have for many years enacted by ordinance laws for the regulation of their local sanitary affairs, aiming to control and prevent the most common and unwholesome nuisances, such as relate to drainage, accumulated filth, and the defilement of water supplies. They have also attempted, with varying success, to make compulsory the notification of infectious and contagious diseases; also, the reporting of births.

The smaller towns, while often manifesting the deepest interest in local affairs, do not frame their ordinances suitable to their local needs, or fail to make them effective by adoption by the Town Trustees or County Supervisors. The communications from correspondents indicate, however, a commendable willingness on the part of citizens generally to aid the Health Officers and Inspectors in every way in their power. Very few recalcitrants have been reported.

Of all the aids to good hygienic results which Boards of Health employ, there is none which exceeds in value that of an efficient Health Officer or Sanitary Inspector. Boards of Health are divided into two classes. The same may be said of nations, political parties, and churches. One will be progressive and active in ferreting out all suggestions of conditions prejudicial to public health. The other will never voluntarily take cognizance of any unsanitary conditions. They feel it their duty to take no action until the danger is brought to their knowledge by a formal complaint of other parties. However dignified this conception of the true functions of a local Board of Health may be, it is far from a conformity with the practical sentiments of the age in which we live.

There have been frequent demands for the "sanitary laws" of the State by the local Boards. The Codes are rarely a part of a physician's library, and the Health Officer or Secretary of a Board often finds it necessary to consult an attorney to ascertain the scope of his duties. The attorney demands a fee. The physician acting as Health Officer is perhaps receiving a nominal salary of \$10 per annum for services which under other circumstances he would not perform at any price. The Trustees will not pay the lawyer, so the Secretary of the State Board is appealed to. He can only inform his correspondent as to the page and section of the Codes or Statutes that relate to his duties as to the subject-matter, but rarely takes the time to write out the sections of the Codes.

In view of the urgent demands for the State laws on sanitary matters, by the correspondents of the State Board, it is deemed expedient to cause them to be printed as a part of this Biennial Report. While it will not be as interesting reading to many as papers and reports on sanitary subjects, yet it is believed that the publication of the laws relating to

public health will be more conducive to the organization and perfection of the health machinery of the State than the publication of any ordinary treatise.

There is in course of preparation a code of sanitary regulations to be issued by the Board, which will be for the instruction of local Boards. It is intended merely as a suggestive Code or outline for their requirements, to be used as a basis for their official action in framing their ordinances.

There is a singular difference in localities and communities with reference to their estimate of any kind of sanitary regulation. Take Redwood City, the county seat of San Mateo County, for example. Redwood City has about two thousand five hundred people, yet it has no Board of Health, and the District Attorney, though an estimable man and an able lawyer, is appointed Health Officer. When urged to send his monthly mortality report before the 10th of each month, he replied that he did not get them in time to enable him to do so; and Redwood City is excluded from the monthly reports of the State Board, because the lawyer Health Officer will not do what the medical Health Officer does—go to the undertakers and Superintendents of cemeteries and make up his report. Redwood City has the usual average of diseases and deaths as shown by the quarterly reports of the County Recorder, so that unusual salubrity of location cannot be advanced as an excuse for not having a Board of Health. It is mentioned merely as an example of unprogressive spirit, shiftlessness, and sanitary unthrift.

MORTUARY STATISTICS.

[For the fiscal year from June 30, 1890, to June 30, 1891.]

In making up the mortuary report for the fiscal year from June 30, 1890, to June 30, 1891, no record of the deaths that occurred during the month of March is included. It has since been found impossible to obtain the data necessary to make up the statistics of that month, which preceded the incumbency of the present Secretary.

The total number of deaths from all causes during the year was 12,820. Estimating the population of California to be 1,250,000, it would make the death rate 12.24 per thousand of the population.

Smallpox.

There were but 4 deaths from smallpox during the year. This disease prevailed to a moderate extent in remote portions of the State, but in every instance it was easily controlled and finally stamped out.

Measles.

There were but 26 deaths due to measles, 8 having occurred in May, 1891, and 5 in June of the same year. The preceding January of the same year claimed 5 deaths from the same cause.

Scarlatina.

There were 39 deaths due to scarlatina during the year, May, 1891, having furnished 9 of the deaths. The remaining deaths were distributed quite evenly throughout the year.

Diphtheria.

There were 488 deaths due to diphtheria, without estimating what occurred in March. As there were 60 deaths in February, and 56 deaths in April, it is fair to presume that there were 50 during the month of March. Adding this number to 488 makes a total of 538 for the year. This would correspond to 4.30 per thousand of population.

Influenza.

Influenza is credited with 50 deaths during the year, the fatality having begun in November. In December, 1890, there were 2 deaths; in January, 1891, there was 1; in February, 1891, there were 8; in April, 17; in May, 13; and in June, there were 7.

Whooping-Cough.

Whooping-cough caused 35 deaths during the year, 17 of which occurred in May during the prevalence of la grippe.

Typhoid Fever.

There were 334 deaths due to typhoid fever; 47 of these are classed on the table under the head of typho-malarial fevers. As the term "typho-malarial" would indicate the specific infection of typhoid fever, it must to all intents and purposes be considered identical with that disease. Inasmuch as the malarial complication is susceptible to remedy, while typhoid is not, it should be classed as typhoid. Its prevalence was quite evenly distributed throughout the year.

Cerebro-Spinal Fever.

Cerebro-spinal fever caused 73 deaths.

Respiratory Diseases.

There were 1,818 deaths due to consumption. Pneumonia caused 1,135. Pleurisy, 29. Bronchitis, 323. Other diseases of the respiratory organs caused 187 deaths.

This would show 3,492 deaths from chronic and acute respiratory diseases during the year. The greatest fatality was from November, 1890, to June, 1891.

Alcoholism.

One hundred and twenty-one deaths are credited to alcoholism, direct or remote, including delirium tremens.

MORTUARY STATISTICS.

[For the fiscal year from June 30, 1891, to June 30, 1892.]

The total number of deaths from all causes during the year were 15,847, making a death rate of 12.67 per thousand, estimating the population at 1,250,000.

Smallpox.

There were no deaths reported from smallpox during the entire year. Very few cases were reported to have prevailed except at the quarantine station on Angel Island, in San Francisco harbor, where it was so completely controlled as to be effectually stamped out.

Measles.

Deaths from measles numbered 84, distributed quite evenly throughout the year, is the sum of fatalities from that disease.

Scarlatina.

There were 103 deaths reported from scarlatina, the greatest fatalities beginning in December, 1891, when there were 15 deaths. There were also 15 deaths in January, 1892; 14 in February; 6 in March; 15 in April, and 14 in May.

Diphtheria.

This disease, as usual, shows a frightful mortality of 484, to which might be added 185 from croup, which makes 669 deaths due to this terrible disease. The fatalities during the different months of the year have varied so little that it is unnecessary to specify them, especially as a glance at the mortuary tables herewith appended will supply the information.

Epidemic Influenza—La Grippe.

During the year there were 223 deaths attributed directly to la grippe. Five occurred in July; 2 in August; 3 in September; 2 in October; 4 in November; 51 in December, 1891; 107 in January; 27 in February; 13 in March; 5 in April; 3 in May, and 1 in June, 1892.

California was visited by an epidemic of influenza during the winter of 1890-91, lasting until the following June. Its onset was simultaneous with reports of the disease in remote parts of the continent. There is reason to believe that it affected those where it could not have been conveyed by travel or other means of conveying the ordinary forms of contagious diseases. It prevailed in the Sacramento and San Joaquin Valleys, the foothill counties at an elevation of from one to four thousand feet, the vicinity of Truckee at an elevation of six thousand feet, and the foggy seacoast at the same time and in precisely the same manner. The dry region of the Colorado Desert at Needles enjoyed no immunity; in fact, suffered more in proportion to numbers than the cities and towns of Southern California.

There was another visitation during last winter, very much intensified, but in the main presenting the same characteristics with corresponding complications and sequelæ. Many who had the disease the first winter were again attacked, and others were afflicted with two and three attacks during the second winter. But few deaths were credited to it directly during the first winter; but during the second, when a familiarity with its clinical features had been very generally established, many deaths were reported, not only from the immediate effects of the epidemic, but more from its results and sequelæ.

This was especially observable in a great increase of diseases of the lungs, notably pneumonia and bronchitis.

As might be expected, the weak and sickly when attacked were the first to succumb; but these were not among the first to take the disease, and while not enjoying an immunity from it, showed no more susceptibility than the robust. The first to show its influence were those habitually exposed to out-door life. All observers agree that when one case appeared in a house nearly every member of the household had it thereafter. Those afflicted with phthisis-pulmonaris were affected in a marked degree when attacked, but it showed no marked predilection for this class, and many pronounced consumptives made good recoveries from la grippe, without showing any deviation in the course of the original disease. No attempt will be made to give the number of fatalities of the epidemic of the last two years. A perusal of the subjoined monthly circular of the State Board of Health will give a general idea of the deaths due to the immediate effects of the malady, and the more remote effects, which it has become the custom among insurance companies to sum up as "results of la grippe." These results have been of a Protean character in California. Pneumonia, bronchitis, catarrhal pneumonia, coryza, with depression and great anxiety, severe cough, dyspnea, extreme soreness in the chest, pain in the back and limbs, stitches in the side, headache, diarrhoea, tonsilitis, pharyngitis, earache, dizziness, and mild delirium were some of the effects of the seizures. A proneness to pneumonia, with a tendency to relapse, was the condition of most patients after an attack. The strong and robust showed no exception to this tendency.

All were left with a sense of depression and lessened vitality. The force of the seizure was spent, in many cases, on the nervous system. Many of this class of cases have not yet recovered, but have progressively declined, losing flesh, and presenting the general symptoms of breaking down of the constitution.

It follows that a disease affecting so profoundly not only the nervous system, but nearly all the organs in the body separately or generally, as a catarrhal fever, must of necessity produce a violent shock on the great number of people who are always living on the brink of the grave, whose diseased hearts or brains, or lungs, or shattered nervous systems, or diseased kidneys have placed them in such a condition that the perturbing influence and sharp fever of la grippe is sufficient to make them easy victims. The same may be said of all epidemics. If a man afflicted with chronic nephritis takes la grippe, and dies during any of its complications, la grippe will be accredited with the cause, and not Bright's disease.

It is not intended to give the history of former epidemics of this disease, nor to descant on its clinical history and exciting cause. These have been pretty generally gone over during the two years that this unwelcome guest has been among us. It will be seen from the above that there has been a sameness of symptoms and general history with all accounts of its manifestations in other countries and other States. To present an opportunity of comparing the prominent features of general symptoms is all that this is intended to comprehend.

The facts in reference to the spread of epidemics of influenza, and the course of the disease in infected localities, are comprehensible upon no other theory than that of a specific infecting principle as its exciting cause. That this principle is carried over vast expanses in an incredible short space of time, producing its specific effects which we call

influenza or la grippe, over vast areas of land and sea without communication from man to man, is believed to be fully established. That when one person in a household is affected with it the infection is sufficient to produce the disease in the others, is accepted by many, and general observation tends in that direction. The medium of its communication is the atmosphere, and if a germ, it must possess the power of reproducing itself in that medium; otherwise, it would become lost by dispersion in traversing distances measured by oceans and continents.

Whooping-Cough.

Whooping-cough is credited with 94 deaths, being nearly three times the number during the previous year. This must be attributed, to a considerable extent, to prevalence of la grippe, which would necessarily increase the fatality of this disease.

Typhoid Fever.

There were 340 deaths from typhoid fever, to which must be added 22 which appear on the tables attributed to typho-malarial fever, making a total of 362 deaths from this cause. Like the preceding year, these fatalities were quite evenly distributed throughout the twelve months.

Cerebro-Spinal Fever.

There were 74 deaths from cerebro-spinal fever during the year, being one more than during the preceding year.

Pulmonary Consumption.

This disease, as usual, takes the lead in the cause of fatality, and heads the list with 2,304 deaths, being a considerable increase over the previous year, when there were 1,818 deaths. A glance at the tables will show that the highest mortality occurred during the height of the epidemic of la grippe.

Pneumonia.

There were 1,415 deaths from pneumonia, as against 1,135 during the previous year. Here again a glance at the tables will indicate that the highest number of fatalities occurred during the month when the highest number of fatalities from la grippe occurred, the disease having jumped from 94 in November to 315 in January.

A corresponding increase is shown in bronchitis and congestion of the lungs. Those months which show the largest number of deaths from la grippe show the largest number of deaths from chronic and acute pulmonary diseases.

Pleurisy.

Pleurisy is credited with but 24 deaths.

Bronchitis.

There were 461 deaths credited to bronchitis, and 139 to congestion of the lungs, while 164 deaths come under the head of other diseases of the respiratory organs. This would show chronic and acute diseases

of the respiratory organs to have caused 4,343 deaths during the fiscal year, which is an increase over the former year of 851.

Alcoholism.

Alcoholism, directly or remote, including delirium tremens, is credited with 192 deaths.

J. R. LAINE, M.D.,
Secretary State Board of Health.

MONTHLY REVIEW OF DEATHS AND PREVAILING DISEASES.

Reported to the State Board of Health from July, 1890, to July, 1892.

[Reprinted from monthly circular of State Board of Health.]

JULY, 1890.

Mortality reports received from 104 cities and towns throughout the State, containing an estimated population of 850,440, give the number of decedents as 1,132, which is a monthly percentage of 1.33 per 1,000, or an annual mortality of 15.96, which is an increased death rate over that of last month. This may in a great measure be attributed to the increased mortality from stomach and bowel disorders, especially cholera infantum among children. We find that the increased temperature during the month was a prominent factor in the causation of these diseases, and no doubt contributed greatly to their fatality.

CONSUMPTION caused nearly as large a mortality as last month, 150 deaths being attributed to it.

PNEUMONIA seemed to be favorably influenced by the warm weather, there being but 50 deaths recorded from it. Of these 34 occurred in San Francisco, the remainder in isolated cases throughout the State.

BRONCHITIS.—Twenty-one cases died from this disease, which is a marked decrease from last report.

CONGESTION OF THE LUNGS was reported fatal in 12 instances.

WHOOPING-COUGH caused 3 deaths.

DIPHTHERIA AND CROUP, collectively, were the cause of 24 deaths, which is a large decrease from the number reported last month. Of the 17 caused by diphtheria, 10 occurred in San Francisco, 3 in Sacramento, 2 in Los Angeles, and 1 each in Haywards and Anaheim.

CHOLERA INFANTUM is reported to have caused 82 deaths, which is the largest mortality in any one month this year. The deaths from this cause in June numbered 51 and in May only 6, showing conclusively how much the disorder is influenced by increased temperature.

DIARRHŒA AND DYSENTERY caused 31 deaths, which is a very marked increase indeed, nearly double the mortality of the preceding month.

SCARLET FEVER was fatal in 2 instances, one of which occurred in San Francisco and 1 in Sacramento.

MEASLES was fatal in 3 instances, 1 in San Francisco, 1 in Downey, and 1 in Los Angeles.

TYPHO-MALARIAL FEVER is credited with causing 1 death in Mendocino.

TYPHOID FEVER is reported to have caused, last month, 32 deaths, which is almost double the mortality in June from this cause, and indicates a laxity of hygienic care in the cleansing of our dwellings, or in the preparation of our food and drink.

REMITTENT FEVER caused 10 deaths, which is also a marked increase over last report.

CEREBRO-SPINAL FEVER was credited with 12 deaths, which is a decrease of nearly one half from last month's report; 8 of these deaths occurred in San Francisco, 2 in Watsonville, 1 in Alameda, and 1 in Jolon.

ERYSIPELAS caused no fatality during the month.

CANCER was fatal in 37 instances.

HEART DISEASE caused 75 deaths.

ALCOHOLISM proved fatal in 10 instances.

DEATHS FROM CAUSES not classified in this abstract numbered 499.

PREVAILING DISEASES.

Reports of diseases received from over 100 towns agree in general that the amount of sickness is limited in nearly every locality; no epidemic is prevailing in any part of the State, if we except, perhaps, measles and whooping-cough, which in a few towns prevail extensively. The many warm days that occurred in July produced, with other factors, a decided increase in stomach and bowel disorders, which in some cases were so severe as to warrant the name of cholera morbus. This severe form of vomiting and purging was noticed as—

CHOLERA MORBUS in Tehachapi, where it was quite prevalent; it was also noted in Williams, Fresno, Downey, Lodi, Pleasanton, Merced, and Sacramento.

DIARRHŒA AND DYSENTERY were observed with frequency in Oakland, San Francisco, Los Angeles, Chico, Alameda, Rio Vista, Gridley, Anaheim, Williams, Redding, Tehachapi,

Middletown, Truckee, Fresno, Downey, Bakersfield, Sausalito, Needles, Lakeport, Etna Mills, Lockeford, Stockton, Hollister, Sacramento, Ione, Calico, Oakdale, El Monte, Newman, San José, and Benicia.

CHOLERA INFANTUM is mentioned as present in a great number of places. In San Francisco it was quite prevalent; it was also noted in Oakland, Haywards, Alameda, Dixon, Davisville, Sacramento, Cllico, Grass Valley, Ione, Los Gatos, Merced, Napa, Petaluma, Pleasanton, Rio Vista, Pomona, San José, Stockton, Vallejo, Gridley, Fresno, Gonzales, Jackson, St. Helena, and Cottonwood.

MEASLES was reported in Sacramento, where it is becoming quite prevalent. It also was noted in Middletown, Downey, Jolon, Sausalito, North San Juan, Hollister, Merced, St. Helena, Los Angeles, and San Francisco.

SCARLET FEVER.—A few cases were reported in Sacramento, San Francisco, Rocklin, Ontario, St. Helena, and Sausalito.

SMALLPOX was reported in North San Juan, but inquiry from Dr. George Farley, our Health Officer, elicited the fact that the report was a mistake, and without any foundation in truth.

DIPHTHERIA AND CROUP.—Some sporadic cases of these diseases were reported in San Francisco, Sacramento, Rio Vista, Anaheim, Tehachapi, Truckee, Cloverdale, Downey, Elk Grove, Etna Mills, Haywards, Los Angeles, and Oakland.

WHOOPING-COUGH was noted in Sacramento, San Francisco, Merced, Williams, Truckee, Hanford, Ontario, Bakersfield, Lodi, Etna Mills, and North San Juan.

ERYSIPELAS.—Some cases of this disease were reported in Cottonwood, Knights Ferry, Fresno, Elk Grove, Bakersfield, Lodi, Eureka, Calico, Ione, and Merced.

TYPHOID FEVER is noted with increasing frequency in our sickness reports. Cases occurred during the month in Igo, Tehachapi, Fresno, Bakersfield, Needles, Lodi, Etna Mills, Eureka, Elsinore, Merced, El Monte, St. Helena, Sacramento, Angels Camp, Los Gatos, Healdsburg, Mendocino, Oakland, Vacaville, San Mateo, Rocklin, and San Francisco.

TYPHO-MALARIAL FEVER was observed in Livermore, Truckee, Hanford, Colfax, and Pleasanton.

REMITTENT AND INTERMITTENT FEVERS are noted in nearly all of our reports, as might be anticipated at this season of the year.

PNEUMONIA is mentioned in a decreasing number of our reports. Sporadic cases were noted in Sacramento, Igo, Jolon, Ione, Alameda, Angels Camp, Berkeley, Eureka, Folsom, Grass Valley, Los Angeles, Petaluma, Oakland, San Benito, Trinity, and San Francisco.

BRONCHITIS was somewhat prevalent in a mild form. It was noted in Igo, Rio Vista, Tehachapi, Downieville, Truckee, Fresno, Galt, Pleasanton, St. Helena, El Monte, Los Angeles, Pasadena, San José, Santa Barbara, and San Francisco.

CHOLERA ASIATICA.—This dread disease shows no sign of abatement in Spain; on the contrary, it is spreading rapidly through the provinces. We are, however, more concerned nearer home, the disease having made its appearance in Japan, to which we are so closely allied by commerce and individual intercourse. The disease having been so clearly proven to be contagious through excretions from the infected body, the utmost vigilance will have to be exercised to prevent the transportation of these poison germs to our shores. But suppose all vigilance fails, and cholera suddenly appears in our midst. The question that should present itself to every community in the State at this moment is: Are we prepared to repel the invader; are our cities, towns, hamlets, and individual premises in such a state of order and cleanliness that disease can find no accumulated filth in which to incubate its germs? If they are, we have nothing to fear, as it has been stated by good authority that the cholera germ is innocuous when it leaves the human organism, and that it requires another medium outside of man to mature and complete its infective properties. That medium is a soil moist and saturated with impurities. If this assertion is true, it necessarily follows that the most complete safeguards against the spread of cholera are a clean soil, untainted air, and pure water. The first may be attained by proper drainage, removal of superincumbent filth, garbage, and all accumulations of dirt within or near our dwelling places. Health Boards and Health Officers should now be more vigilant than ever, and enforce, with all the power the law gives them, the proper cleansing of the districts under their charge. They are the officers accountable to the people for the preservation of their lives when threatened by disease; their responsibility is great, and their remuneration should be adequate. We know that cholera cannot exist or extend when the means of its existence are destroyed. To do this is the work of local Boards of Health and Health Officers. No favoritism or dislike to prosecute offenders in the enforcement of the provision of the law should, for a moment, influence the health authorities when a great danger like the present menaces the community. It can be averted by every Sanitary Board and every Sanitary Officer doing their whole duty conscientiously, without fear or favor; whereas, putting off to a more convenient season that which should be done to-day, may be followed by an epidemic of one of the most fatal of diseases, the end of which no man can foretell or its results foresee.

PACIFIC COAST WEATHER SUMMARY.

During the month of July the weather in the Pacific Coast States has not been characterized by unusual conditions. The rainfall has been below the normal at all stations except San Francisco, where the increase amounts to .02 of an inch. The deficiency

ranged from "trace," at Red Bluff and Los Angeles, Cal., to .74 of an inch at Spokane Falls, Washington. No rainfall was reported from Southern California during the month. Rain fell on five days at Yuma, but in amounts too small to measure. In Northern California rain fell at San Francisco on the 8th, Eureka on the 8th and 20th, and amounts too small to measure at Keeler on the 20th and 21st. In Oregon the rainfall was confined to the northern portion of the State, and in Washington to the southern and extreme eastern portions. The heaviest monthly rainfall for July (1.64 inches) occurred at Fort Canby, Washington. The heaviest daily rainfall (.54 of an inch) occurred at Fort Canby on the 9th.

The temperature has been above the normal at all stations except Red Bluff, Portland, and Olympia, where it has remained stationary. The increase has varied from about 1° at Fort Canby and Spokane Falls to 9° at Los Angeles.

It is important to note, in connection with these remarks, that the reports from Signal Service stations furnish data from which general estimates of weather conditions are made. Therefore, this review, in its brief summarization of the events of the month, cannot take account of peculiar local effects. Reports from a greater number of stations would necessarily bring to light peculiar circumstances of rainfall and temperature, which are rather to be expected in a region so subject to local peculiarities as the Pacific Coast States.

Abstract of the Reports of Deaths and their Causes in California during July, 1890.

Other Causes	121001212122000000000101023105110310400
Alcoholism	000001000

[illegible]

Other Causes	14 10 4 1 0 3 0 1 2 3 3 1 1 0 1 0 0 2 3 3 0 4 0 0 0	499
Alcoholism	0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0	10
Heart Diseases	1 1 0 0 0 0 0 0 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 1	75
Erysipelas	0 0	0
Cancer	0 0 1 0	37
Cerebro - Spinal Fevers	0 2 0 0 0	12
Remittent and Intermittent Fevers	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0	10
Typhoid Fever	1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0	32
Typho - Malarial Fever	0 0	1
Whooping-Cough	0 0	3
Smallpox	0 0	0
Measles	0 0	3
Scarlet Fever	0 0	2
Croup	0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0	7
Diphtheria	0 0	17
Other Diseases of St'mach & Bow'ls	2 0 0 0 0 0 0 0 0 1 2 0 0 0 0 0 0 0 0 0 0 0 0 0	78
Cholera Infantum	0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 1 0 0 0 0 0	82
Diarrhœa and Dysentery	0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0	31
Congestion of the Lungs	0 1 0 1 0	12
Acute Bronchitis	0 1 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0	21
Acute Pneumonia	0 0 0 0 0 1 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0	50
Consumption	0 0 1 2 0 0 0 0 0 0 0 2 1 0 0 0 0 1 0 0 0 0 0 0	150
Total Deaths	18 3 3 6 5 0 0 4 0 0 1 4 1 1 1 3 1 1 3 4 4 2 7 0 1	1,132
Estimated Population	12,000 5,400 7,500 5,500 450 8,000 600 1,500 10,000 15,000 2,500 1,000 850 500 1,300 5,000 2,800 3,000 6,000 4,000 3,000 2,500 800 600 4,000	850,440
LOCATIONS AND AUTHORITIES.	San Mateo County, County Recorder..... Santa Barbara, Dr. R. F. Winchester..... Santa Cruz, Dr. C. L. Anderson..... Santa Rosa, Dr. H. C. Crowder..... Sausalito, Dr. H. J. Crumpton..... San Benito County, Dr. J. H. Tebbetts..... Shasta, Dr. J. M. Briceland..... Shasta, Dr. E. C. Rhodes..... Siskiyou County, County Recorder..... Stockton, Dr. C. A. Ruggles..... St. Helena, Dr. W. J. G. Dawson..... Susan, Dr. J. W. B. Reynolds..... Susanville, Dr. A. Milliken..... Tehachapi, Dr. A. Shafer..... Truckee and vicinity, Dr. W. Curless..... Trinity County, G. F. Gorman, H. O..... Tulare City, Dr. C. F. Taggart..... Ukiah, Dr. E. W. King..... Vallejo, Dr. W. D. Anderson..... Vacaville and Elmira, Dr. J. W. Stitt..... Visalia, Dr. T. W. Pendergrass..... Watsonville, Dr. W. D. Rodgers..... Wheatland, Dr. L. Melton..... Williams, Dr. A. W. Kimball..... Woodland, Dr. T. Ross..... Totals.....	

AUGUST, 1890.

Mortality reports received for the month of August from 96 different localities throughout the State, with an estimated population of 806,360, give the number of decedents as 1,065, a monthly percentage of 1.32 per 1,000, or an annual mortality at the rate of 15.84 per 1,000, which is somewhat less than that of the preceding month. The mortality from cholera infantum and stomach and bowel disorders continues without much abatement.

CONSUMPTION caused 157 deaths during the month, which is an increase over last report. PNEUMONIA had only 41 deaths attributed to it, which is a decrease of 10 from last month. Twenty-eight of these occurred in San Francisco, 4 in Oakland, 3 in San José, the balance in single instances scattered here and there.

BRONCHITIS caused 29 deaths; of these 20 occurred in San Francisco, 3 in Los Angeles, 1 each in Vallejo, San José, San Bernardino, Sacramento, Oakland, and Fresno.

CONGESTION OF THE LUNGS was fatal in 11 instances.

WHOOPIING-COUGH caused 3 deaths.

DIPHTHERIA AND CROUP, collectively, caused 29 deaths, 25 being from diphtheria and 4 from croup. Of the former, 11 occurred in San Francisco, 2 in Los Angeles, 3 in Alameda, 4 in Sacramento, and 1 each in San José, Oakdale, Pasadena, Cloverdale, and Anaheim.

CHOLERA INFANTUM is reported to have caused 76 deaths in August, which is only 6 less than in the previous month.

DIARRHŒA AND DYSENTERY were fatal in 25 instances, which is a slight decrease from last report.

SCARLET FEVER was fatal in 2 instances, 1 in San Francisco and 1 in Antioch.

MEASLES caused but 1 death, which occurred in Hollister.

SMALLPOX caused no deaths.

TYPHO-MALARIAL FEVER is credited with 5 deaths.

TYPHOID FEVER—Twenty-eight deaths were reported as caused by this disease, which is a decreased number from the previous month.

REMITTENT FEVER caused 6 deaths.

CEREBRO-SPINAL FEVER is credited with 10 deaths.

ERYSIPELAS caused no fatality during August.

CANCER was fatal in 40 instances.

HEART DISEASE is credited with 63 deaths.

ALCOHOLISM was fatal in 12 cases.

DEATHS FROM CAUSES not classified in this abstract number 451.

PREVAILING DISEASES.

Reports of sickness received from 110 localities throughout the State indicate a very favorable condition of the public health. If we except some bowel disorders that are a very general complaint, we might say that no sickness prevailed to any extent.

CHOLERA INFANTUM was increased in prevalence by the more than average high temperature experienced during the month. It was reported present in Sacramento, Redlands, Fresno, Pleasanton, Middletown, Gridley, Redding, Lockeford, Salinas, Brownsville, Cloverdale, Mariposa, Tulare, Dixon, Cottonwood, Forest Hill, Martinez, Alameda, Berkeley, Grass Valley, Gonzales, Haywards, Oakland, San José, Santa Cruz, Merced, Santa Rosa, Pomona, Orland, and San Francisco.

DIARRHŒA AND DYSENTERY were reported as noticed with increased frequency in Tehachapi, Pleasanton, Middletown, Santa Cruz, San Bernardino, Truckee, Redding, Galt, Hanford, Azusa, Lodi, Lockeford, Lakeport, Susanville, Brownsville, Benicia, Cloverdale, Newman, Williams, Ontario, Fresno, Forest Hill, Calico, Downey, Merced, Anaheim, Chico, Los Angeles, Rio Vista, Oakland, San Diego, Santa Rosa, and San Francisco.

CHOLERA MORBUS.—Some cases of this formidable disease were noticed in Middletown, Pleasanton, Eureka, Lakeport, Anaheim, Cottonwood, Cloverdale, Downey, Williams, Lockeford, Truckee, and Fresno.

MEASLES was reported as quite prevalent in Sacramento; it also was noticed in Pleasanton, Truckee, Dixon, Sausalito, Downey, and Hollister.

SCARLET FEVER.—Some sporadic cases of this disease were reported in Sacramento, Sausalito, Antioch, and San Francisco.

DIPHTHERIA AND CROUP were reported from Sacramento, Truckee, Rocklin, Newcastle, Oakdale, Anaheim, Etna Mills, Tulare, Cloverdale, Elk Grove, Los Angeles, Pasadena, San José, San Francisco, and Alameda. From the latter city Dr. J. T. McLean reports 18 cases, nearly all of whom were attending one of the public schools. He says: "An old cement sewer laid 12 years ago in the block in which this public school is situated, wore out and caved in, thus stopping the flow of sewage from the residences and school in this block. The old sewer was taken up and replaced by a new ironstone one. The process of change from the old to the new sewer occupied a fortnight. During this time sewer gas and disease germs escaped and contaminated the atmosphere in the neighborhood. The school children were more or less exposed, especially those whose curiosity drew them frequently and for a length of time to the vicinity of the sewer. The disease developing in these children, it is believed this broken sewer, with its escaping gas and disease germs, was the exciting cause of this sickness. In one family, where 3 children had diphtheria, 1 of them dying, the plumbing and sewerage were defective, the filth that should go into the sewer escaping into the cellar and contaminating the

atmosphere of the house, from which the sickness and death in this family resulted. Other cases of the disease are of a mild type."

WHOOPING-COUGH was noticed in Truckee, Sacramento, Rocklin, Lodi, Salinas, Etna Mills, Sausalito, and Merced.

ERYSIPELAS, in sporadic form, is mentioned in reports from Truckee, Eureka, Oakdale, Lodi, Anaheim, Mariposa, Susanville, Sausalito, St. Helena, Calico, and Fresno.

TYPHOID FEVER is reported in a very limited number of places in sporadic form, and no doubt arising from local preventable causes: Lockeford, Sacramento, Lodi, Forest Hill, Alturas, Brownsville, Healdsburg, Dixon, St. Helena, Merced, Angels Camp, San Bernardino, Antioch, Chico, Los Angeles, Oakland, San José, Fresno, Santa Ana, Santa Rosa, Stockton, and San Francisco.

TYPHO-MALARIAL FEVER was reported in Truckee, Redding, Galt, Hanford, Oakdale, Anaheim, Knights Ferry, Mariposa, Igo, Susanville, Cottonwood, Merced, Benicia, Yuba City, and Fresno.

REMITTENT FEVER is reported in Tehachapi, where, Dr. Shafer says, it is known as "mountain fever," and then often confounded with typhoid fever. The disease was also present in Anderson, Shasta, Truckee, Gridley, Redding, Newcastle, Needles, Cloverdale, Knights Ferry, Newman, Dixon, and Rocklin.

CEREBRAL FEVER was reported in a limited number of cases in St. Helena, Downey, Santa Cruz, San José, Fresno, San Diego, Galt, and San Francisco.

PNEUMONIA is seldom mentioned in the report for August. Sausalito, Healdsburg, Alameda, Antioch, Chico, Oakland, Petaluma, Sacramento, San Diego, San José, Fresno, and San Francisco report a few cases.

BRONCHITIS was reported in Brownsville, Benicia, Newman, Downey, Tehachapi, Pleasanton, Middletown, Eureka, Galt, Lockeford, Los Angeles, Oakland, Sacramento, Fresno, San José, Vallejo, and San Francisco.

The following is extracted from the Monthly Circular of the Connecticut State Board of Health, as full of interest to California at this season:

SUMMER DIARRHŒA.—A report pregnant with interest at this season of the year has lately been made to the local Government Board of England, relating to the causes of diarrhœa. The investigation of the subject covered a period of 8 years, from 1880 to December, 1888, and an extensive territory, including towns of high and low diarrhœal mortality. It studied carefully the following:

(1) *General Conditions* in their influence as etiological factors, to wit: Temperature of the air—Temperature of the earth to the depth of 4 feet—Rainfall—Air movement.

(2) *Conditions and Locality*, such as—Elevations above sea-level—Soil—Density of population—Impediments to ventilation—Dark and dirty dwellings—Sewer or cesspool emanations—Filthy accumulations of domestic refuse in privies, garbage heaps, etc.—Polluted drinking water.

(3) *Conditions relating to the Population*—As social position—Food and artificial feeding of infants—Maternal neglect and carelessness in infant management. The report gives as the result of this exhaustive study conclusions which the author modestly calls provisional hypothesis. While he accords to a high temperature a very potent influence, he says "it is exerted indirectly," and is not a direct cause of diarrhœa. The following remarkable statement appears in the report: "The summer rise of diarrhœal mortality does not begin until the mean temperature recorded at 4 feet below the earth's surface attains about 56° F., no matter what might have been the previous temperature of the atmosphere or that recorded by the 1-foot earth thermometer." And that the maximum diarrhœal mortality of the year is in the week in which the temperature recorded by the 4-foot earth thermometer attains its mean weekly maximum. And, further, that the decline of the diarrhœal mortality coincides with the decline of temperature recorded by the 4-foot earth thermometer without regard to the atmospheric temperature.

The effect of rainfall seems to depend upon its reducing the earth temperature.

Air Movement.—In diarrhœal season, calm promotes it and high winds lessen it.

Soil.—Diarrhœal mortality is favored by soils permeable to water and air. Rock and impermeable soils lessen it. The presence of organic matter in the soil favors a high diarrhœal mortality.

Density of Population, and everything which contributes to foul the air or interfere with its free circulation, enhances the diarrhœal death rate.

Domestic Darkness and General Dirtiness of Dwellings conduce to diarrhœal mortality; if with these the habitations are crowded and the ventilation bad, then the mortality is highest. *Sewer or cesspool emanations* in a concentrated form and suddenly let loose, the author says, are of themselves capable of occasioning a diarrhœal epidemic.

Food-keeping, exposed in cellars and closets to emanations from domestic filth will produce diarrhœa, especially if stored in dark places and not exposed to currents of air. He sums up the report with the following suggestions: That the essential cause of diarrhœa resides ordinarily in the superficial layers of the earth, where it is intimately associated with the life processes of some micro-organism not yet detected.

That the vital manifestations of such organism are dependent upon conditions of seasons, and on the presence of dead organic matter, which is its pabulum.

That in certain conditions, particularly of temperature, these organisms become volatile, and are wafted through the air, attaching themselves to such organic material as will afford them a nidus and pabulum.

That in food, both in and out of our bodies, such micro-organisms find the proper conditions for their development, multiplication, and evolution.

And that when so received into the human body, they are the material cause of epidemic diarrhœa.

That for obvious reasons bottle-fed babies are most exposed to this infection.

PACIFIC COAST WEATHER SUMMARY.

The month of August has been characterized by a general deficiency of rainfall and a general increase of temperature.

The rainfall has been decidedly above the average in southeastern California, southwestern Nevada, and southern Arizona, where destructive floods, high winds, and thunder storms have occurred. Precipitation has been below the normal at all Signal Service stations except Yuma, Keeler, Fresno, and Spokane Falls. The increase at these stations range from trace at Fresno to 1.61 inches at Keeler. The deficiency ranges from .02 of an inch at San Francisco to .54 of an inch at Portland. Rain fell on 3 days at San Diego, but in amounts too small to measure. The rainfall at Sacramento was a trace, which is the normal condition for the month. Red Bluff was the only station reporting no rain during the month. The heaviest rainfall, 1.71 inches, occurred at Keeler, and a trace at San Diego, Fresno, Sacramento, and San Francisco.

LOCAL STORMS.—On the 5th heavy rains and high winds occurred in southeastern California and southern Arizona. Redlands, California, 2.16 inches; Riverside, California, .55 of an inch; San Bernardino, rain for four hours with heavy thunder storm; Tucson, Arizona, over 60 miles of railroad track washed away. August 6th.—First rain of season in San Diego County; heavy in fruit districts and mountains. At Palmetto, Nevada, 8.60 inches reported as falling in 1 hour, and on the 11th 8.80 inches in about 2 hours, causing great damage to roads. August 10th.—Thunder storm at Topo, San Benito County, California. August 17th.—Thunder storm at Ashland, Oregon, and heavy showers at Shasta, Petaluma, Sonoma, and San Francisco. August 9th.—Los Angeles County, heavy rain, damage to hay and dried fruits.

The temperature has been above the normal at all Signal Service stations. The increase has ranged from 1° at Yuma, to 8° at Los Angeles and Walla Walla. The highest temperature, 110°, occurred at Yuma on the 17th. The lowest temperature, 36°, occurred at Baker City on the 31st.

Abstract of the Reports of Deaths and their Causes in California during August, 1890.

LOCATIONS AND AUTHORITIES.	Other Causes	Alcoholism	Heart Diseases	Erysipelas	Cancer	Cerebro - Spinal Fevers	Remittent and Intermittent Fevers	Typhoid Fever	Typho - Malarial Fever	Whooping-Cough	Smallpox	Measles	Scarlet Fever	Croup	Diphtheria	Other Diseases of St'mach & Bow'ls	Cholera Infantum	Diarrhoea and Dysentery	Congestion of the Lungs	Acute Bronchitis	Acute Pneumonia	Consumption	Total Deaths	Estimated Population
Alturas, Dr. J. M. Forrest	2	3	2	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2,250
Alameda, Dr. John T. McLean	16	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	16	11,250
Anaheim, Dr. J. H. Bullard	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2,000
Anderson, Dr. O. P. Paulding	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1,500
Angels Camp, Dr. J. R. Darroh	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2,000
Antioch, Dr. W. S. George	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	1,000
Auburn, R. S. Waldo, H. O.	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1,500
Azusa and vicinity, Dr. J. H. Miller	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,500
Benicia, Dr. E. Gray	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	2,800
Berkeley, Dr. F. H. Payne	5	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	5	5,500
Brownsville, Dr. L. C. Crossman	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	600
Calico, Dr. A. R. Rhea	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,000
Colton, Dr. M. F. Price	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	2,000
Colusa, Dr. R. A. Gray	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2,000
Cottonwood, Dr. J. O. Smith	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,200
Cloverdale, Dr. R. S. Markell	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1,700
Chico and vicinity, Dr. W. King	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	13,000
Davisville, Dr. W. E. Bates	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	800
Dixon, Dr. A. Trafton	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2,500
Downeyville, Dr. A. Jump	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,000
Downey and vicinity, Dr. J. Q. Rowley	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2,500
Eltna Mills, Dr. E. W. Bathurst	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	500
Elk Grove, Dr. J. H. McKee	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	500
Eureka, Dr. S. B. Foster	7	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	10,000
Elsmore, Dr. T. E. Ellis	600	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	500
Forest Hill and vic., Dr. Paul Reudy	3,000	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	3,000
Fresno, Dr. T. M. Hayden	4,000	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	4,000
Folsom, Dr. B. F. Bates	1,500	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,500
Galt, Dr. A. Montague	2,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2,000
Grass Valley, Dr. W. C. Jones	6,000	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	6,000
Gonzales, Dr. C. A. Hertel	500	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	500
Gridley, Dr. J. T. Harris	1,350	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,350
Georgetown, Dr. W. S. Hickman	1,500	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,500

1,300	Hanford, Dr. J. A. Davidson.....
1,200	Haywards, Dr. G. E. Alexander.....
4,000	Healdsburg, Dr. N. B. Coffman.....
2,000	Hollister, Dr. J. H. Tebbets.....
600	Igo, Dr. H. Schafer.....
250	Knights Ferry, Dr. J. H. Lowe.....
500	Locketford, Dr. E. N. Foote.....
1,800	Livermore, Dr. E. M. Keys.....
500	Little Stony, R. S. Burgett, J. P.....
1,000	Lincoln, A. C. Fleming, H. O.....
1,500	Lakeport, Dr. S. R. Mather.....
1,200	Lodi, Dr. F. W. Colman.....
2,000	Long Beach, Dr. J. W. Wood.....
80,000	Los Angeles, Dr. G. MacGowan.....
4,000	Marysville, Dr. D. Powell.....
1,500	Merced, Dr. E. S. O'Brien.....
3,000	Mendocino, Dr. J. W. Milliken.....
2,400	Modesto, Dr. W. J. Wilhite.....
1,000	Mariposa, Dr. W. J. Kearney.....
500	Middletown, Dr. R. E. Hartley.....
2,000	Martinez, Dr. J. B. Tennant.....
6,000	Napa, Dr. M. B. Pond.....
4,000	Nevada City, Dr. F. K. Waggoner.....
800	Newman, Dr. Stratton.....
400	Newcastle, Dr. M. Schnabel.....
750	Needles, Dr. J. P. Booth.....
60,000	Oakdale, Dr. D. D. Crowley.....
1,000	Oakdale, Dr. R. H. Endicott.....
2,000	Oroville, Dr. J. H. M. Karsner.....
3,000	Orland, Dr. W. Thurston.....
2,000	Ontario, Dr. W. E. Scott.....
10,000	Pasadena and vicinity, Dr. H. H. Sherk.....
8,000	Petaluma and vicinity, Dr. L. H. Patty.....
3,500	Placerville, Dr. H. W. A. Worthen.....
3,900	Pomona and vicinity, Dr. S. F. Davis.....
800	Pleasanton, Dr. W. H. Cope.....
3,000	Redding, Dr. F. P. Mitchell.....
1,800	Rio Vista, Dr. S. C. Brown.....
1,200	Rocklin and vicinity, Dr. A. M. Stafford.....
30,000	Sacramento, Dr. H. L. Nichols.....
2,700	Salinas City, Dr. M. C. E. Gydisson.....
15,000	San Bernardino Co., County Recorder.....
32,000	San Diego, Dr. D. Goehnauer.....
300,000	San Francisco, Dr. J. W. Kenney.....
15,000	San José, Dr. J. E. Curmow.....

Other Causes	6 4 6 0 2 1 1 1 0 8 6 2 1 1 0 0 2 0 0 0	451
Alcoholism	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	12
Heart Diseases	0 1 2 0 1 0 1 0 0 0 1 0 0 0 0 0 0 0 0	63
Erysipelas	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0
Cancer	0 0 0 0 0 0 0 0 0 1 1 0 0 1 0 0 0 0 0	40
Cerebro - Spinal Fevers	0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0	10
Remittent and Intermittent Fevers	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	6
Typhoid Fever	0 1 0 0 0 0 1 0 0 1 0 0 0 0 0 0 0 0 0	28
Typho - Malarial Fever	0 0 0 0 0 0 0 0 0 0 0 1 0 1 0 0 0 0 0	4
Whooping-Cough	0 0 0 0 0 0 0 0 0 0 0 0 0 2 0 0 0 0 0	3
Smallpox	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0
Measles	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	1
Scarlet Fever	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	2
Croup	0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0	4
Diphtheria	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	25
Other Diseases of St'mach & Bow'ls	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0	78
Cholera Infantum	0 0 0 0 2 0 1 0 0 0 0 0 0 0 0 0 0 0 0	76
Diarrhoea and Dysentery	0 0 0 0 0 0 1 0 0 0 0 0 1 1 0 0 0 0 0	25
Congestion of the Lungs	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	11
Acute Bronchitis	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0	29
Acute Pneumonia	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	41
Consumption	0 1 0 0 0 0 0 0 0 2 0 1 0 0 0 0 0 1 0	157
Total Deaths	6 7 8 0 0 6 1 1 5 1 1 12 8 5 2 5 0 0 4 1 1 0 3	1,065
Estimated Population	12,000 15,000 5,400 1,000 7,500 1,800 5,500 150 1,000 15,000 2,800 850 500 1,300 5,000 3,000 6,000 600 600 4,000	806,390
LOCATIONS AND AUTHORITIES.	San Mateo County, County Recorder Santa Ana and vic., Dr. J. G. Bailey Santa Barbara, Dr. R. F. Winchester Santa Maria, M. Thornberg, H. O. Santa Cruz, Dr. C. L. Anderson Santa Paula, Dr. M. F. Patten Santa Rosa, Dr. H. Crowder Sausalito, Dr. H. J. Crumpton Slason, Dr. E. C. Rhodes Stockton, Dr. C. A. Ruggles St. Helena, Dr. W. J. G. Dawson Susanville, Dr. A. Milliken Tehachapi, Dr. A. Shater Truckee and vicinity, Dr. W. Curless Trinity County, G. E. Norman, H. O. Tulare City, Dr. C. F. Taggart Vallejo, Dr. W. D. Anderson Wheatland, Dr. L. Melton Williams, Dr. A. W. Kimball Woodland, Dr. T. Ross Totals.....	

SEPTEMBER, 1890.

Mortality reports received from 85 different localities throughout the State, with an estimated population of 705,309, give the number of decedents as 920, being a monthly percentage of 1.3 per 1,000, or an annual mortality at the rate of 15.6 per 1,000, which is a considerable decrease from the previous month. The mortality from cholera infantum has in a marked measure decreased, as also have diseases of the respiratory organs.

CONSUMPTION caused 130 deaths in September, which is 27 less than last month. PNEUMONIA was fatal in 54 instances, which is a slight increase over last report. BRONCHITIS was credited with only 15 deaths, against 41 for the previous month, which is a decrease of 26 during the month.

CONGESTION OF THE LUNGS was fatal in 16 instances.

WHOOPING-COUGH caused but 2 deaths.

DIPHTHERIA AND CROUP, collectively, caused 30 deaths, which is about the same as last month. Nineteen were from diphtheria and 11 from croup. Of those from diphtheria, 8 occurred in San Francisco, 3 in Chico, 2 each in Los Angeles and Haywards, and 1 each in Watsonville, Pasadena, Modesto, and Marysville. From croup, 3 died in Sacramento, 5 in San Francisco, and 1 each in Pasadena, San José, and Grass Valley.

CHOLERA INFANTUM was credited with 45 deaths, which is a decrease of nearly one half the mortality recorded for August. The cooler weather during the month no doubt contributed not a little to this result.

DIARRHOEA AND DYSENTERY were fatal in 24 instances, which is also a decline.

SCARLET FEVER was fatal in but 1 instance, and that in San Francisco.

MEASLES caused but 1 death, which occurred in Los Angeles.

TYPHO-MALARIAL FEVER caused 1 death in Roseville.

TYPHOID FEVER was fatal in 30 cases, which is a small mortality.

REMITTENT FEVER caused 5 deaths.

CEREBRAL FEVER, which includes cerebro-spinal meningitis, is reported to have caused 10 deaths. Of these, 4 occurred in San Francisco, 1 each in Angels Camp, Fresno, Haywards, Pacific Grove, San Diego, and Watsonville.

ERYSIPELAS was fatal in 4 instances during the month; 1 each in Sacramento, San Francisco, San José, and Santa Cruz.

CANCER caused 29 deaths.

HEART DISEASE was fatal in 69 instances.

ALCOHOLISM is credited with 10 deaths during the month.

DEATHS FROM CAUSES not classified in this abstract, 401.

PREVAILING DISEASES.

Reports of sickness from 98 localities throughout the State continue to indicate a very favorable condition of the public health. It does not appear from any of them that epidemic disease of any description is present anywhere in the State. Bowel disorders are quite prevalent, as might be expected at this season, when fruit is indulged in without regard to quantity, and very often to quality. The cooler weather of the month past has had a beneficial effect in lessening the frequency and fatality of summer diarrhoea in children.

CHOLERA INFANTUM was noticed in sporadic form in Pasadena, Salinas, Chico, Gridley, Pleasanton, Knights Ferry, Lone, Lockeford, Mariposa, Angels Camp, Colton, Eureka, Marysville, Nevada City, Oakland, San Francisco, Sacramento, Pacific Grove, Roseville, San José, and Santa Ana.

DIARRHOEA AND DYSENTERY were reported in Azusa, Downey, Needles, Pacific Grove, Downieville, Lodi, Susanville, Brownsville, Lakeport, Chico, College City, Galt, Pleasanton, Hanford, Bakersfield, Fresno, Redding, Williams, Hollister, Julian, Modesto, Los Angeles, Oakland, Sacramento, and San Francisco.

MEASLES is evidently decreasing in the State. A few cases were noticed in Santa Cruz, Rocklin, Hollister, Los Angeles, San Francisco, and Sacramento.

SCARLET FEVER.—A limited number of cases were reported in Sacramento, Santa Cruz, Rocklin, Hollister, and San Francisco. The type is very mild, without any tendency to spread, although given every opportunity to do so. In Sacramento, it has come to our knowledge that children are permitted to attend school while the skin is still desquamating from the children's hands. As this is the most infectious stage, we are surprised at the limitation of the disease. This may be owing to the general good health of the school children, enabling them to resist the attack of the communicable germ; or it may be that the disease has but a weak effective power, and requires some unknown factor to give it that epidemic tendency which makes it one of the most dreadful of the communicable diseases.

DIPHTHERIA AND CROUP were present during the month in Truckee, Chico, San José, Hanford, Sacramento, Knights Ferry, Grass Valley, Haywards, Los Angeles, Marysville, Modesto, Pasadena, and San Francisco. In Chico, Dr. King writes, the disease was chiefly confined to one family, although five other cases appeared subsequently. Strict quarantine, however, prevented any extension of the disease. In Sacramento there was a serious outbreak of diphtheria and diphtheritic croup in the Protestant Orphan Asylum, which was, fortunately, confined to that institution; a few sporadic cases were, however, noted in the city. We cannot too earnestly impress upon the authorities that each case of such disease is a public danger, against which the public, as represented by its local sanitary authorities, is entitled to be warned by proper information, and we

believe that where an institution like the Orphan Asylum is the seat of epidemic contagious disease, it is the duty of the local Sanitary Officer to visit such institution, and have it properly disinfected under his personal supervision. Such disinfection should not be intrusted to those ignorant of the precautionary duties required, or left to the chance of a superficial sprinkling of carbolized water about the room as a sufficient remedy to destroy the germs of the disease. We believe that much of the diphtheria that exists is dependent upon insufficient disinfection where a case occurs. The germ, we know, is most tenacious of life, and except the most skilled disinfection is exercised, will continue to live and propagate its hateful existence for an indefinite period of time. We should therefore require all Health Officers to see to this matter themselves, and know that through their exertions all ordinary precautions have been taken to insure immunity to the public under their charge.

WHOOPING-COUGH was present in Sacramento, Salinas, Truckee, Anderson, and San Francisco.

ERYSIPELAS is mentioned in reports from Pacific Grove, Chico, Sacramento, Santa Cruz, San José, and San Francisco.

TYPHOID FEVER is reported with increasing frequency as the season advances. Sporadic cases occurred in Salinas, Downey, Needles, Lodi, Chico, Brownsville, Lakeport, Wheatland, Eureka, Igo, Alturas, Ione, Mariposa, Hollister, Stockton, Santa Ana, Santa Barbara, Los Angeles, San Francisco, Sacramento, Oakland, Grass Valley, and Nevada City. The increase in the prevalence of typhoid fever is to be expected at this season of the year, and will continue year after year until the public appreciate the fact that this is a PREVENTABLE disease, and wholly within its own power to eradicate. Its prevention simply requires perfect cleanliness about our persons and premises, and constant watchfulness of the sources of supply of our drinking water. All water from a suspected source should be boiled before using. Numerous instances are recorded where typhoid fever was spread from the rinsing of milk cans with water apparently pure, but really infected with the germs of typhoid fever capable of infecting the milk. We have no doubt that many of the cases of typhoid fever which have baffled our research for their origin have arisen in this way. Most of our dairies have their water supply from wells sunk in the cow yard, where they receive the drainage from the polluted soil. It is a matter of history that cattle themselves suffer from a disease analogous to typhoid fever, if not the identical disease itself. It would, therefore, be an act of prudence on the part of our Health Officers to visit our dairies and examine the source of their water supply, and the means used in keeping the milk from pollution. Milk from an unknown or a suspicious source should be heated to the boiling point before using, as thus is effectually destroyed not only the germs of typhoid fever, but likewise the germs of consumption, which are very commonly conveyed through milk taken from tuberculous cows.

CEREBRAL FEVER was reported in isolated cases in Pacific Grove, Sacramento, Redding, Angels Camp, Fresno, Haywards, San Diego, Watsonville, and San Francisco.

REMITTENT AND INTERMITTENT FEVERS were reported in a good many places, but the type was mild and occurred chiefly along the river bottoms and in the irrigated districts, in preference to other localities.

PNEUMONIA is again becoming frequent in our reports. It was present in Salinas, Santa Cruz, Truckee, San Francisco, Sacramento, Chico, Eureka, Ione, Fresno, Folsom, Haywards, Sisson, Los Angeles, Monterey, Mendocino, Oakland, Petaluma, San Diego, and Gonzales.

BRONCHITIS was quite prevalent in many localities. It was noticed in Downey, Truckee, Needles, Brownsville, Chico, Galt, Pleasanton, Eureka, Bakersfield, Igo, Williams, Mariposa, and San Francisco. The type was mild, and the fatality quite limited.

PACIFIC COAST WEATHER SUMMARY.

The month of September has been characterized by a general increase of temperature, with an excess of rainfall in the south and a deficiency in the north.

RAINFALL.—It has been above the average in southeastern Oregon, California, western Nevada, and western Arizona, being especially marked in the Sacramento and San Joaquin Valleys. It has been below the average in western Oregon and Washington. The excess ranges from .09 of an inch at Los Angeles to 1.18 inches at Fresno. The deficiency ranges from .32 of an inch at Roseburg to 3.03 inches at Fort Canby. Rain fell on the following dates in Washington: 1st, 2d, 5th, 6th, 11th, 14th to 17th, 19th, 30th. Oregon: 1st, 16th, 19th, 23d, 26th, 29th, 30th. California: 4th, 5th, 15th, 16th, 18th, 19th, 22d to 30th. Nevada: 24th to 30th. Arizona: 1st, 3d to 8th, 10th, 15th to 19th, 23d, 24th, 28th, 30th. The following are the heaviest rainfalls for the month: Cisco, 3.13 inches; Colfax, 3.05 inches; Auburn, 2.77 inches; Red Bluff, 1.50 inches; Fresno, 1.30 inches. All stations have reported more or less rain during the month. The period of greatest rainfall was from the 27th to the 30th. It began in Southern California on the afternoon of the 27th, owing to the southwestward movement of a large area of cold air from Utah and Nevada, which had gradually moved southward from Montana on the 25th and 26th. This office issued rain forecasts for Southern California at 6 p. m. of the 25th, 48 hours in advance of the storm. Northern California also received rain forecasts equally far in advance of the storm. On the evening of the 27th, and also on the morning of the 28th, special rain warnings were telegraphed to all parts of California and portions of western Nevada. In spite of the general character of the rain and excessive amounts in certain localities, the damage to crops is reported to be comparatively small.

LOCAL STORMS.—Thunder storms occurred on the 2d at Spokane Falls; 5th, Susanville; 16th, Hollister; 23d, Phoenix; 24th, Fresno and San Miguel; 25th, Porterville. Hail storms occurred at Spokane Falls, 2d; Tombstone, 14th and 23d.

TEMPERATURE.—It has been above the normal at all Signal Service stations except Keeler, Fresno, Eureka, and Fort Canby, where the deficiency has ranged from 1° to 3°. The increase has ranged from 2° at Olympia to 8° at Walla Walla, and 9° at Los Angeles and Yuma. The highest temperature, 110°, occurred at Yuma, on the 3d and 4th. The lowest temperature, 24°, occurred at Baker City, on the 7th and 12th.

FROST.—It occurred at Baker City on the 1st, Newark and Winnemucca on the 2d, Baker City on the 3d, Drain, Or., on the 5th, Winnemucca on the 9th.

[illegible][illegible]

ABSTRACT FOR SEPTEMBER, 1890—Continued.

Other Causes	3420211000	401
Alcoholism	0000000000	10
Heart Diseases	10000100000	69
Erysipelas	0000000000	4
Cancer	10000000000	29
Cerebro - Spinal Fevers	00000001000	10
Remittent and Intermittent Fevers	0000000000	5
Typhoid Fever	0000000000	30
Typho - Malarial Fever	0000000000	1
Whooping-Cough	0000000000	2
Smallpox	0000000000	0
Measles	0000000000	1
Scarlet Fever	0000000000	1
Croup	0000000000	11
Diphtheria	00000001000	19
Other Diseases of Stomach & Bowels	00000100000	43
Cholera Infantum	000000100010	45
Diarrhoea and Dysentery	0000000000	24
Congestion of the Lungs	00000100000	16
Acute Bronchitis	0000000000	15
Acute Pneumonia	00100000000	54
Consumption	20001000000	130
Total Deaths	74315223010	920
Estimated Population	2,800 850 1,300 5,000 6,000 4,500 2,500 900 600 4,000	705,309
LOCATIONS AND AUTHORITIES.	St. Helena and vic., Dr. W. J. G. Dawson. Susanville, Dr. A. Milliken. Truckee and vicinity, Dr. W. Curless. Trinity County, G. E. Norman, H. O. Vallejo, Dr. W. D. Anderson. Vacaville and Elmira, Dr. J. W. Stitt. Watsonville, Dr. W. D. Rodgers. Wheatland, Dr. L. Melton. Williams, Dr. A. W. Kimball. Woodland, Dr. T. Ross.	Totals

OCTOBER, 1890.

Mortality reports received from 80 different localities throughout the State, with an estimated population of 754,639, give the number of decedents as 1,016, being a monthly percentage of 1.34+ per 1,000, or an annual mortality of 16.08 per 1,000, which is an increase over that of the previous month.

CONSUMPTION is credited with 150 deaths, which is an increase of 20 over the death rate in September.

PNEUMONIA caused 56 deaths, which is also an increase over last report.

BRONCHITIS was fatal in 20 instances.

CONGESTION OF THE LUNGS caused 7 deaths.

WHOOPING-COUGH caused 4 deaths.

DIPHTHERIA is credited with 39 deaths, which is a large increase over the mortality caused by this disease last month. Twenty of these deaths occurred in San Francisco, where the disease is quite prevalent, 4 in Los Angeles, 3 in Alameda, 3 in Sacramento, 2 in Sausalito, and 1 each in San José, Visalia, Grass Valley, Fresno, Chico, Napa, and Newcastle.

CROUP caused 18 deaths, which is a large increase over the deaths from it last month. Thirteen died in San Francisco, 2 in Santa Ana, and 1 each in Stockton, San José, and Sacramento.

CHOLERA INFANTUM is credited with 32 deaths, which is a decrease from last report.

DIARRHOEA AND DYSENTERY were fatal in 13 instances.

SCARLET FEVER caused 1 death, which occurred in Oakland.

MEASLES was fatal in 2 instances, 1 in Sacramento, and 1 in Shasta.

TYPHO-MALARIAL FEVER, although quite prevalent, caused but 3 deaths.

TYPHOID FEVER is credited with 36 deaths, which is an increase over the number reported last month.

REMITTENT FEVER is credited with 5 deaths.

CEREBRO-SPINAL FEVER is reported to have caused 5 deaths.

ERYSIPELAS was fatal in 2 instances.

CANCER caused 29 deaths, which is about the monthly average.

HEART DISEASE caused 89 deaths.

ALCOHOLISM is credited with 15 deaths during the month.

DEATHS FROM CAUSES not classified in this abstract, 428.

PREVAILING DISEASES.

Reports received from 86 localities in different parts of the State indicate an increase of sickness in most of them, especially in those diseases affecting the respiratory system. This might have been expected, as these diseases are greatly influenced by the mean temperature. They increase in prevalence as the temperature falls, and diminish as it rises. During the month of October the temperature was generally higher than normal during the earlier part of the month, but later there was a rapid fall, in some places so marked as to produce frost. This change seemed at once to determine an increase of pneumonia, bronchitis, and a condition of pulmonary affection approximating very closely to "la grippe," without inducing the severe debilitating effect coincident with that disease. It was also observed that the change in temperature had given a temporary prevalence to bowel disorders in those persons whose excretory functions were particularly active and easily influenced by variations in temperature.

CHOLERA INFANTUM, which, at this season of the year, usually diminishes in frequency, was noticed as prevailing in many places. Sporadic cases occurred in Sacramento, Cloverdale, Gridley, Lodi, Redding, Middletown, Oakland, Haywards, Alameda, San José, San Francisco, Downey, Fresno, Berkeley, and Grass Valley.

DIARRHOEA AND DYSENTERY were reported in Hanford, El Monte, Hopland, Lodi, Redding, Eureka, Gridley, Visalia, Truckee, Galt, Sacramento, Hollister, Shasta, Downey, Fresno, College City, Chico, Los Angeles, San Diego, and San Francisco.

MEASLES is prevailing in some few places—Sacramento, Elk Grove, Igo, Monterey, and Rocklin.

SCARLET FEVER.—Sporadic cases of this disease were observed in Sacramento, San Francisco, Oakland, Hollister, Pacific Grove, and Truckee.

WHOOPING-COUGH was reported in San Francisco, Oakland, Lockeford, Truckee, and Sacramento.

ERYSIPELAS.—Sporadic cases of this disease were reported in Truckee, Fresno, College City, and San Francisco.

TYPHOID FEVER.—The reports of this disease are increasing, the continued dryness of the weather being very favorable for its development. Sporadic cases were reported in Cloverdale, Cedarville, Napa, Lodi, Truckee, Galt, Igo, Elk Grove, Soquel, Nevada City, St. Helena, Oakland, Calico, Downey, Alameda, Oakland, San Francisco, San José, and Santa Ana.

TYPHO-MALARIAL FEVER was reported to be present in Hanford, Hopland, Cloverdale, Redding, Visalia, Cottonwood, Biggs, Hollister, Fresno, and College City.

REMITTENT AND INTERMITTENT FEVERS are not prevailing to any extent. Some few cases were observed in Gridley, Visalia, Knights Ferry, Redding, Truckee, Cottonwood, Fresno, Pacific Grove, Dixon, Anderson, Calico, Lockeford, Igo, Galt, and Marysville.

CEREBRAL FEVER was reported in isolated cases in Redding, Fresno, Grass Valley, and Pasadena.

PNEUMONIA was quite prevalent during the latter part of the month. It was so reported in San Francisco, Oakland, Alameda, Sacramento, Hanford, El Monte, Cottonwood, Lakeport, San José, St. Helena, Anderson, Gonzales, Fresno, Los Angeles, and Santa Barbara.

BRONCHITIS prevailed very generally, and was reported in College City, Fresno, Downey, St. Helena, Middletown, Lakeport, Lockeford, Galt, Visalia, Eureka, El Monte, Salinas, Los Angeles, and San Francisco.

INFLUENZA was mentioned in nearly all our reports as having been observed during the latter part of the month, some of our correspondents being of the opinion that it was a prelude to la grippe of last winter.

DIPHTHERIA AND CROUP have been quite prevalent during the month, assuming a malignancy in many cases that has been quite unusual hitherto. In view of this prevalence, the State Board of Health has deemed it advisable to publish, for gratuitous distribution, a small pamphlet on the disease, its restriction and prevention, which can be had on application to the Secretary at Sacramento. The conditions being favorable for the development of the disease, the local health authorities should look more strictly to the public safety than they apparently do in the presence of these cases of diphtheria. They have the power of requiring from those persons attacked, that in regard to residence and otherwise, they shall so conduct themselves as not unnecessarily to multiply the chances of extending the affection to others. Public funerals should be strictly forbidden, and the transportation by rail of those dead from diphtheria should not be allowed, except under the most stringent provisions and competent inspection. Each case of such disease is a public danger against which the public is entitled to be warned by proper information. Any person knowingly having this disease under his care or control, who voluntarily neglects to take all the necessary precautions to prevent its spread, should not only be punishable by penalty, as for an act of nuisance, but should be liable to pay pecuniary damages for whatever harm he may occasion to others. At this time it would be well for parents to keep a watchful eye upon the animals with which their children play, as it is a well-ascertained fact that dogs and cats are very frequent carriers of infection into a household. An instance occurred in this city where a pet cat contracted diphtheria from a sick child and conveyed it to a neighbor's child who unfortunately played with it just after it had left the infected home. Cats having diphtheria generally display it by a yellow discharge through the nose, a gummy secretion about the eyes, a hoarse voice, and a desire for quiet and seclusion. Dogs are not nearly so subject to diphtheria as cats, but are liable to carry the infection on their hair. A curious fact recently discovered by Dr. Klein, and confirmed by the Health Officers in London, is that cats suffering from diphtheria manifest the disease more frequently in inflammatory deposit in the lungs than elsewhere, and while in this condition they were capable of communicating the disease to children, as when it manifested itself in the throat and nose. In San Francisco the disease is reported as almost epidemic, and ascribed to emanations proceeding from filthy sewers. It was also quite prevalent in Sacramento, in the vicinity of the drainage canal; was reported in Visalia, Napa, Sausalito, Hopland, Lodi, Eureka, Truckee, San José, St. Helena, Los Angeles, Downey, Fresno, Newcastle, Grass Valley, Chico, and Alameda. The extension of this disease to so many parts of the State may, perhaps, be attributed to some condition in the atmosphere of which we are ignorant, but we do know that wherever the germ is deposited, it is nurtured in filth and developed where sanitation is deficient.

PACIFIC COAST WEATHER SUMMARY.

The most striking feature of the weather for the month of October has been the marked deficiency in rainfall throughout the Pacific Coast States. The cause of this decrease in precipitation is due to a falling off in the number of storms which have entered the North Pacific Coast from the Japan Current, and also, and more especially, to the fact that these storms have passed eastward at a higher latitude than in previous Octobers. In order to illustrate this very important fact, I have prepared a set of storm-track charts for October, 1889, and 1890. A glance at these charts will show the relation between the extreme southerly position of the storm paths in October, 1889, and the extraordinary rainfall of that month, and the relation between the extreme northerly position of the storm paths and the marked deficiency of rainfall for October, 1890. The amount and distribution of rainfall dependent upon the latitude of the storms from the Japan Current, is one of the most important features of Pacific Coast weather, and is worthy of the careful attention of the public.

RAINFALL.—Except in Arizona, the rainfall is everywhere deficient. The decrease varies from .20 of an inch at Baker City and Keeler to 2.95 inches at Eureka, and 2.13 inches at Olympia. The excess varies from .88 of an inch at Fort Grant to 1.58 inches at Yuma. Rain fell on the following dates in Washington: 1st to 8th, 11th to 24th; Oregon: 1st to 8th, 11th to 14th, 16th to 19th, 22d; California: 1st to 3d, 9th, 10th, 18th, 19th; Nevada: 1st, 2d, 9th to 11th, 14th; Arizona: 1st to 4th, 10th to 12th. The heaviest rainfalls in 24 hours were 1.50 inches at Yuma on the 4th, and 1.22 inches at Fort Canby on the 5th. The heaviest monthly rainfalls were Fort Canby 5.30 inches, Portland 2.80 inches, Olympia 2.60, and Yuma 1.70. The following stations reported no rainfall during the month: San Francisco, Sacramento, Red Bluff, Fresno, Los Angeles, San Diego. Snow was reported as follows on the mountains: California, 9th, 10th, 20th; Nevada, 9th, 10th; Washington, 16th.

STORMS.—Hail storm near Tucson, Arizona, 4th. Thunder storms: Arizona, 4th; California, 17th. High winds on the Oregon and Washington coast, 2d, 5th, 6th to 9th, 13th, 15th, 18th, 20th, 24th, 27th, 28th. The maximum wind velocity at Fort Canby varied from 36 miles per hour on the 6th to 72 miles per hour on the 18th. Crescent City, Cal., high wind and heavy sea on the 28th.

TEMPERATURE.—The temperature has been generally above the normal. The excess ranges from 1° at Olympia to 10° at Los Angeles. The deficiency ranges from 2° at Eureka to 4° at Baker City. It remains stationary at Fort Canby and Fresno. The highest temperature—98°—occurred at Los Angeles on the 21st and 27th. The lowest temperature—20°—occurred at Baker City on the 15th. Frost occurred on the following dates in California: 3d, 9th to 12th, 14th to 17th, 20th; Oregon: 3d, 7th, 9th to 11th, 15th, 17th, 21st, 30th, 31st; Washington: 3d, 4th, 9th to 11th; Nevada: almost daily; Arizona: 12th. Ice formed at Silverton, Or., 14th.

Abstract of the Reports of Deaths and their Causes in California during October, 1890.

[illegible][illegible]

Included in the above, and reporting no deaths, are the following: Biggs (pop. 2,000), Dr. O. C. Hawkins; Calico (pop., 1,000), Dr. A. R. Rhea; Dixon (pop., 2,500), Dr. A. Frattori; Downieville (pop., 1,000); Elk Grove (pop., 500), Dr. J. H. McKee; Elsinore (pop., 1,200), Dr. T. S. Ellis; Forest Hill and vicinity (pop., 3,000), Dr. Paul Reudy; Folsom (pop., 1,500), Dr. B. F. Bates; Lockeford (pop., 500), Dr. E. N. Foote; Long Beach (pop., 2,000), Dr. J. W. Wood; Orland (pop., 3,000), Dr. W. Thurston; Rocklin (pop., 800), Dr. A. M. Stafford; Wheatland (pop., 700), Dr. Melton.

NOVEMBER, 1890.

Mortality reports received from 103 localities throughout the State, with an estimated population of 752,739, give the number of decedents as 1,133, being a monthly percentage of 1.55 per 1,000, or an annual mortality at the rate of 18.60 per 1,000, which is the largest death rate we have had for many months. This increase is not due to the prevalence of any particular epidemic, but rather to the increased area of country in which diphtheria, typhoid fever, and acute pulmonary diseases have been present. The mortality from pneumonia, for instance, just doubled that for October, and the deaths from diphtheria and croup were also largely in excess of the preceding month.

CONSUMPTION caused the death of 157 persons, which is an increase over last month.

PNEUMONIA was fatal in 110 instances, which is double the increase over last report.

BRONCHITIS caused 24 deaths.

CONGESTION OF THE LUNGS was fatal in 19 cases.

WHOOPING-COUGH caused 2 deaths.

DIPHTHERIA is credited with 58 deaths, which is a largely increased mortality over last report. Thirty-seven of these deaths occurred in San Francisco, 4 in Alameda, 3 each in Los Angeles and Modesto, 2 in Napa, and 1 each in Bakersfield, Tulare, Visalia, Santa Rosa, Santa Paula, Sausalito, San José, Downey, and Lorin.

CROUP.—The mortality from this disease kept pace with diphtheria, 38 deaths being attributed to it, 23 occurring in San Francisco, 1 each in Calico, Colton, Downey, El Monte, Folsom, Healdsburg, Los Angeles, Santa Ana, San José, Woodland, and 4 in Santa Cruz. In each of these places diphtheria was also reported.

CHOLERA INFANTUM was reported as causing 27 deaths, which is a decreased number of deaths from last report.

DIARRHŒA AND DYSENTERY were fatal in 16 instances.

SCARLET FEVER caused 5 deaths; 2 in San Francisco, 2 in Woodland, and 1 in San Diego.

MEASLES caused no deaths.

SMALLPOX caused 1 death in San Francisco.

TYPHO-MALARIAL FEVER was fatal in 2 instances only.

TYPHOID FEVER caused 37 deaths, which is the same number as last month, when the disease began to be more frequently observed.

REMITTENT AND INTERMITTENT FEVERS were fatal in but 4 instances.

CEREBRO-SPINAL FEVER is credited with 8 deaths, which is a slight increase.

ERYSIPELAS caused 3 deaths.

CANCER was fatal in 37 instances, which is an increase over last report.

HEART DISEASES were fatal to 76 persons.

ALCOHOLISM caused 16 deaths.

DEATHS FROM CAUSES not classified in this abstract, 441.

PREVAILING DISEASES.

Reports from over 100 localities in different parts of the State indicate a general increase of sickness throughout. There does not appear to be any epidemic prevailing, if we except a decided frequency of throat affections, especially tonsillitis, membranous angina, and diphtheria. The frequency of diseases of the respiratory system is also noticed, and an apparent tendency to the reappearance of epidemic.

INFLUENZA, now familiarly known as "la grippe," is observed by most of our correspondents. The abnormally dry weather which prevailed during the past month seems to have had a deleterious effect upon the general health, and probably determined that frequency to malaise which everywhere is a subject of complaint.

CHOLERA INFANTUM, though usually in abeyance so late in the year, was observed with frequency in many places. It is noticed in reports from Wheatland, Gridley, Redding, Elsinore, Fresno, Visalia, Needles, Martinez, Oakland, Petaluma, San José, and San Francisco.

DIARRHŒA AND DYSENTERY were reported as observed, with some frequency, in Blacks, Santa Paula, Oakdale, Wheatland, Pleasanton, Gridley, Downey, Igo, Redding, Mariposa, Elsinore, San Pedro, Eureka, Shasta, Fresno, Visalia, Bakersfield, Needles, El Monte, Brownsville, Oakland, Mendocino, and San Francisco.

MEASLES.—Some few cases were reported in Sausalito, Pleasanton, San Francisco, and Sacramento.

SCARLET FEVER.—A few cases were reported in San Francisco, Sacramento, Sausalito, Newcastle, Pacific Grove, Santa Cruz, Fresno, College City, Woodland, San Diego, and El Monte. Dr. Manson writes that several cases appeared at Graniteville, in Nevada County, of a mild type.

DIPHTHERIA AND CROUP appear to have been almost universally prevalent, being observed in San José, Santa Rosa, Santa Cruz, Santa Ana, Blacks, Santa Paula, Sausalito, Lockeford, Lodi, Newcastle, Elk Grove, Downey, Sacramento, Folsom, Visalia, Downieville, College City, Middletown, Bakersfield, Truckee, Williams, Colton, Lorin, Los Angeles, Modesto, Merced, Calico, Rio Vista, Napa, Oakland, Alameda, and San Francisco. In San Francisco 255 cases were reported during the month. In Alameda, Dr. John T. McLean thinks the prevalence of the disease is, in the main, owing to the imperfect way quarantine is maintained, and the lack of proper isolation of those sick with the disease. In Anaheim, Dr. Bullard writes that he thinks the disease originated in the school-room of a modern school, where the sewer pipe, imperfectly laid, became obstructed and filled with most offensive matter. On having this removed, the prevalence of sore throat

abated. There is a form of sore throat prevailing, which was recognized in Santa Cruz by Dr. Anderson, which, although resembling in some respects diphtheria, is not that disease, being non-contagious, and accompanied by a marked ulceration of the tonsils, but without the characteristic odor of diphtheria. It is seldom fatal, but as it is a matter of difficulty to tell one from the other, the safer plan is to treat all such cases as diphtheria, and isolate them accordingly. In Stockton, Dr. C. A. Ruggles considers diphtheria as bad a disease in a community as smallpox, and, as Health Officer, treats them with the same sanitary precaution, insisting on isolation and strict quarantine. In this manner he has succeeded in literally "stamping out" the disease wherever it has appeared, thus preventing its extension from the place of its development.

WHOOPING-COUGH was reported as still prevalent in Lockeford and Anderson.

ERYSIPELAS was reported in sporadic form in Newcastle, Gridley, Blacks, Alturas, Ontario, Fresno, Truckee, Brownsville, and Bakersfield.

TYPHOID FEVER was observed in a few instances in Newcastle, Wheatland, Downey, Igo, Redding, Fresno, Bakersfield, Truckee, Cloverdale, Calico, Chico, Grass Valley, Lodi, Los Angeles, Marysville, Oakland, Sacramento, San José, San Francisco, Santa Ana, Tulare, and Watsonville. The dryness of the soil, and consequent lowering of the ground water, does not seem to have had the developing effect upon this disease that Pettenkoffer's theory would lead us to expect, as the cases recorded were all due to local causes, which sanitary efforts might have prevented.

TYPHO-MALARIAL FEVER was present in Wheatland, Knights Ferry, San Pedro, Ontario, Visalia, College City, and Truckee.

REMITTENT FEVER is not prevailing to any extent. It was noted in reports from San Francisco, Oakdale, Wheatland, Redding, Benicia, Lockeford, Shasta, Fresno, Cottonwood, Bakersfield, Truckee, Cloverdale, Chico, and Dixon.

CEREBRAL FEVER.—This disease was reported in sporadic form in Berkeley, Los Angeles, Pacific Grove, San Francisco, Vallejo, Redding, San Pedro, and College City.

PNEUMONIA was quite prevalent everywhere. It was noted in reports from Oroville, San José, Stockton, Haywards, Sacramento, Knights Ferry, Pleasanton, Redding, Blacks, Chico, Anderson, Elsinore, Los Angeles, Visalia, Eureka, Lockeford, Glendora, St. Helena, Cloverdale, Alameda, Berkeley, Brownsville, Etna Mills, Grass Valley, Lincoln, Los Gatos, Oakland, and San Francisco. The disease in many cases was of that low form known as *typhoid pneumonia*, and was particularly fatal when attacking persons beyond the middle period of life. In aged persons its fatality was very marked.

BRONCHITIS was also very prevalent, and was reported by all our correspondents as noticed in their districts.

INFLUENZA was very generally noted in our reports, and many of our correspondents considered that la grippe was again prevailing in their districts. The present influenza, so far as noticed, has failed to develop the intense prostration so very characteristic of the genuine la grippe. It is, however, more than probable that this symptom will not be wanting if the disease continues to increase in intensity.

MUMPS was epidemic in Pleasanton.

VARICELLA was observed in Sacramento.

SMALLPOX, we regret to say, has again been imported into San Francisco, this time from Central America by sea. The disease is epidemic in Guatemala, and may have come from this source. Three cases developed in San Francisco during November, and two since then. This should admonish us of the necessity of insisting that our school children be vaccinated as the law contemplates. This precaution would place our children in a condition to resist an invasion of the disease and prevent any extensive epidemic, if such a disaster threatened us. Of the protective power of vaccination against smallpox, there can be no question. History has again and again proven it, and in the last report of the Health Officer in Ireland, he declares that there was not a single case of the disease reported there within the past year, for the reason that vaccination is compulsory, and every one is brought under the operation of the law.

PACIFIC COAST WEATHER SUMMARY.

The most remarkable feature of the weather for the month is the extraordinary deficiency of rainfall. It is a deficiency which affects the entire Pacific Slope from Mexico to British Columbia. The proximate cause for this deficiency is found in the high latitude of the easterly movement of cyclonic areas from the Pacific Ocean. In spite of the fact that there were a large number of these areas, only one of them passed south of the northern boundary of the United States. This area gave rise to a peculiar secondary cyclonic effect, which passed southward into Nevada, and gave rise to the sudden and rather heavy rains in western Arizona and southern California. This secondary area was forced southward by the rapid formation of a high barometer in Washington and Oregon. A weather record for San Francisco, embracing a period of 42 years, shows that never before within that time has the month of November been so deficient in rainfall. The smallest amounts previously recorded are .15 of an inch in 1862, .25 in 1876, and .26 in 1884. A chart with the storm tracks for November, 1884, shows but 3 cyclonic areas, 2 of which passed eastward north of Washington, and the 3d through the northern portion of that State. This slight deflection to the southward of one of those areas was sufficient to give California a few light showers. The cyclonic areas for November, 1890, have been peculiar, not only for their high latitude, but also for their rapidity of movement, which has tended to increase their number, that is unusually large for the month. The rapidity of movement also explains the large number of days on which light showers fell in Wash-

ington and Oregon (nearly two thirds of the month), and the small total of precipitation. The conditions for rainfall were no sooner formed than a change in the cyclonic circulation drove them away. It is not within the province of this review to discuss the question as to the cause of the extreme northerly movement of the cyclonic areas for this month.

RAINFALL.—It is everywhere deficient, and the amount of such deficiency varies from .06 of an inch at Keeler to 6.15 inches at Olympia. The deficiency increases in amount from south to north, and is especially remarkable north of the 38th parallel. Rain fell on the following dates in Washington: 5th, 11th, 13th, 14th, 17th, 18th, 22d to 24th, 26th to 28th. Oregon, 5th to 8th, 11th, 22d to 27th. California, 5th to 7th, 22d to 25th. Nevada, 6th to 9th. Arizona, 6th to 8th. The heaviest rainfalls in 24 hours were .66 of an inch at Fort Canby on the 8th, and .56 of an inch at San Diego on the 7th. A fall of 2.65 inches was reported from Globe, Arizona, on the 8th. The heaviest monthly rainfalls were .70 of an inch at San Diego and Olympia. The following stations report no rainfall: Walla Walla, Winnemucca, Red Bluff, Sacramento, and San Francisco. Snow is reported as follows: Washington, 6th, Whitman County; Oregon, 6th, Harney County; California, 5th, Plumas, Yuba, and Sierra Counties, 2 to 24 inches; 6th, Ventura County; Nevada, 6th and 8th; Arizona, 8th, on Pinal Mountains.

LOCAL STORMS.—Hail storm at Belotta, Cal., 8th. Thunder storm at Quincy, Cal., 5th. High "northers" occurred in California on the 11th and 12th, during the prevalence of an area of extremely high barometer in northern Nevada, Idaho, and Oregon. The barometer during this time was from .40 to .60 of an inch above the normal. In some places the wind was reported as reaching a velocity of over 60 miles per hour, causing damage to fences, trees, and roofs of buildings. Floods were reported from western Arizona on the 8th, causing high water in the Gila and Colorado Rivers.

TEMPERATURE.—It has been above the normal in all districts. The excess ranges from 3° at Olympia to 12° at Los Angeles. The highest temperature, 96°, occurred at Los Angeles on the 3d. The lowest, 10°, occurred at Winnemucca on the 13th.

Abstract of the Reports of Deaths and their Causes in California during November, 1890.

LOCATIONS AND AUTHORITIES.	1890		1891		1892		1893		1894		1895		1896		1897		1898		1899		1900	
	Deaths	Population	Deaths	Population	Deaths	Population	Deaths	Population	Deaths	Population	Deaths	Population	Deaths	Population	Deaths	Population	Deaths	Population	Deaths	Population	Deaths	Population
Alturas, Dr. J. M. Forrest.	1	2,250	18	11,250	23	2,000	33	2,000	33	1,500	18	1,800	25	1,800	11	1,800	11	1,800	11	1,800	11	1,800
Alameda, Dr. John T. McLean.	1	2,000	2	2,000	3	2,000	3	2,000	3	2,000	3	2,000	3	2,000	3	2,000	3	2,000	3	2,000	3	2,000
Anaheim, Dr. J. H. Bullard.	1	2,000	2	2,000	3	2,000	3	2,000	3	2,000	3	2,000	3	2,000	3	2,000	3	2,000	3	2,000	3	2,000
Antioch, Dr. W. S. George.	1	1,500	2	1,500	3	1,500	3	1,500	3	1,500	3	1,500	3	1,500	3	1,500	3	1,500	3	1,500	3	1,500
Anderson, Dr. O. P. Paulding.	1	1,800	2	1,800	3	1,800	3	1,800	3	1,800	3	1,800	3	1,800	3	1,800	3	1,800	3	1,800	3	1,800
Auburn, A. S. Waldo, H. O.	1	1,800	2	1,800	3	1,800	3	1,800	3	1,800	3	1,800	3	1,800	3	1,800	3	1,800	3	1,800	3	1,800
Azusa and vicinity, Dr. J. H. Miller.	1	3,200	2	3,200	3	3,200	3	3,200	3	3,200	3	3,200	3	3,200	3	3,200	3	3,200	3	3,200	3	3,200
Bakersfield (Oct. & Nov.), Dr. C. A. Rogers.	1	2,800	2	2,800	3	2,800	3	2,800	3	2,800	3	2,800	3	2,800	3	2,800	3	2,800	3	2,800	3	2,800
Benicia, Dr. E. Gray.	1	4,000	2	4,000	3	4,000	3	4,000	3	4,000	3	4,000	3	4,000	3	4,000	3	4,000	3	4,000	3	4,000
Berkeley, Dr. F. H. Payne.	1	1,000	2	1,000	3	1,000	3	1,000	3	1,000	3	1,000	3	1,000	3	1,000	3	1,000	3	1,000	3	1,000
Blacks, Dr. F. M. Stratton.	1	1,000	2	1,000	3	1,000	3	1,000	3	1,000	3	1,000	3	1,000	3	1,000	3	1,000	3	1,000	3	1,000
Brownsville, Dr. L. C. Crossman.	1	1,800	2	1,800	3	1,800	3	1,800	3	1,800	3	1,800	3	1,800	3	1,800	3	1,800	3	1,800	3	1,800
Calico, Dr. A. R. Rhea.	1	1,500	2	1,500	3	1,500	3	1,500	3	1,500	3	1,500	3	1,500	3	1,500	3	1,500	3	1,500	3	1,500
Cedarville, Dr. B. Woodbridge.	1	2,500	2	2,500	3	2,500	3	2,500	3	2,500	3	2,500	3	2,500	3	2,500	3	2,500	3	2,500	3	2,500
Colton, Dr. M. F. Price.	1	1,200	2	1,200	3	1,200	3	1,200	3	1,200	3	1,200	3	1,200	3	1,200	3	1,200	3	1,200	3	1,200
Cottonwood, Dr. J. O. Smith.	1	1,700	2	1,700	3	1,700	3	1,700	3	1,700	3	1,700	3	1,700	3	1,700	3	1,700	3	1,700	3	1,700
College City, Dr. C. H. Gibbons.	1	10,000	2	10,000	3	10,000	3	10,000	3	10,000	3	10,000	3	10,000	3	10,000	3	10,000	3	10,000	3	10,000
Cloverdale, Dr. R. S. Markell.	1	800	2	800	3	800	3	800	3	800	3	800	3	800	3	800	3	800	3	800	3	800
Chico and vicinity, Dr. W. King.	1	2,500	2	2,500	3	2,500	3	2,500	3	2,500	3	2,500	3	2,500	3	2,500	3	2,500	3	2,500	3	2,500
Davisville, Dr. W. E. Bates.	1	1,000	2	1,000	3	1,000	3	1,000	3	1,000	3	1,000	3	1,000	3	1,000	3	1,000	3	1,000	3	1,000
Dixon, Dr. A. Trafton.	1	2,500	2	2,500	3	2,500	3	2,500	3	2,500	3	2,500	3	2,500	3	2,500	3	2,500	3	2,500	3	2,500
Downeyville, Dr. A. Jump.	1	2,500	2	2,500	3	2,500	3	2,500	3	2,500	3	2,500	3	2,500	3	2,500	3	2,500	3	2,500	3	2,500
Downey and vicinity, Dr. Q. J. Rowley.	1	750	2	750	3	750	3	750	3	750	3	750	3	750	3	750	3	750	3	750	3	750
Elk Mills, Dr. E. W. Bathurst.	1	500	2	500	3	500	3	500	3	500	3	500	3	500	3	500	3	500	3	500	3	500
Elk Grove, Dr. J. A. McKee.	1	10,000	2	10,000	3	10,000	3	10,000	3	10,000	3	10,000	3	10,000	3	10,000	3	10,000	3	10,000	3	10,000
Eureka and vicinity, Dr. S. B. Foster.	1	1,200	2	1,200	3	1,200	3	1,200	3	1,200	3	1,200	3	1,200	3	1,200	3	1,200	3	1,200	3	1,200
Elsinore, Dr. T. E. Ellis.	1	800	2	800	3	800	3	800	3	800	3	800	3	800	3	800	3	800	3	800	3	800
El Monte, Dr. F. P. Cave.	1	3,000	2	3,000	3	3,000	3	3,000	3	3,000	3	3,000	3	3,000	3	3,000	3	3,000	3	3,000	3	3,000
Forest Hill and vic., Dr. Paul Reudy.	1	9,000	2	9,000	3	9,000	3	9,000	3	9,000	3	9,000	3	9,000	3	9,000	3	9,000	3	9,000	3	9,000
Fresno, Dr. T. M. Hayden.	1	1,500	2	1,500	3	1,500	3	1,500	3	1,500	3	1,500	3	1,500	3	1,500	3	1,500	3	1,500	3	1,500
Folsom, Dr. B. F. Bates.	1	2,000	2	2,000	3	2,000	3	2,000	3	2,000	3	2,000	3	2,000	3	2,000	3	2,000	3	2,000	3	2,000
Galt, Dr. A. Montague.	1	6,000	2	6,000	3	6,000	3	6,000	3	6,000	3	6,000	3	6,000	3	6,000	3	6,000	3	6,000	3	6,000
Grass Valley and vic., Dr. W. C. Jones.	1	4	2	4	3	4	3	4	3	4	3	4	3	4	3	4	3	4	3	4	3	4

LOCATIONS AND AUTHORITIES.	Estimated Popula- tion	Total Deaths	Consumption.....	Acute Pneumonia..	Acute Bronchitis..	Congestion of the Lungs	Diarrhoea and Dys- entery.....	Cholera Infantum..	Other Diseases of St'mach & Bow'ls	Diphtheria	Croup	Scarlet Fever	Measles.....	Smallpox	Whooping-Cough..	Typho - Malarial Fever.....	Typhoid Fever....	Remittent and In- termittent Fevers	Cerebro - Spinal Fever.....	Cancer	Erysipelas.....	Heart Diseases	Alcoholism.....	Other Causes
Gonzales, Dr. C. A. E. Hertel.....	500	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Georgetown and vic., L. D. Markes, H. O.	800	5	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Gridley, Dr. J. T. Harris	2,500	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hanford, Dr. J. A. Davidson	1,400	5	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Haywards, Dr. G. E. Alexander	1,200	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Healdsburg, Dr. N. B. Coffman.....	4,000	6	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Igo, Dr. H. Schafer	600	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Knights Ferry, Dr. J. H. Lowe	250	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lockeford, Dr. E. N. Foote	500	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lancolin, Dr. C. Clark	1,000	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lakeport, Dr. S. R. Mather	1,500	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Long Beach, Dr. J. W. Wood	2,000	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Los Gatos, Dr. F. W. Knowles	1,700	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lorin, Dr. E. J. Ashmore	1,000	4	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lodi, Dr. E. A. Burchard	1,200	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Los Angeles, Dr. G. MacGowan	65,000	60	20	3	0	2	0	0	1	3	1	0	0	0	0	0	0	0	0	0	0	0	0	1
Marysville, Dr. D. Powell	4,000	8	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Merced, Dr. E. S. O'Brien	1,500	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Middletown, Dr. R. L. Hartley	800	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Modesto, Dr. W. J. Wilhite	2,000	6	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mariposa, Dr. W. J. Kearney	1,000	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Monterey, Dr. H. W. Faulkner	2,000	9	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Martinez, Dr. J. B. Tennant	2,000	9	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mendocino, Dr. J. W. Milliken	3,000	9	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Napa, Dr. M. B. Pond	5,000	7	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nevada City, Dr. F. R. Waggoner	3,000	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Newcastle, Dr. M. Schnabel	400	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Needles, Dr. J. P. Booth	750	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
North San Juan, Dr. G. S. Farley	500	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
North Bloomfield, Dr. J. Manson	1,500	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Oakland, Dr. D. D. Crowley	60,000	56	8	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Oroville, Dr. J. H. M. Karner	2,000	5	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Orland, Dr. W. Thurston	3,000	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Oakdale, Dr. R. H. Endicott	1,000
Pasadena and vicinity, Dr. H. H. Sherk	1,200
Petaluma, Dr. L. H. Puffy	8,000
Pomona and vicinity, Dr. S. F. Davis	3,600
Pleasanton, Dr. W. H. Cope	700
Pacific Grove, Dr. O. S. Trimmer	1,390
Redding, Dr. F. P. Mitchell	3,000
Rio Vista, Dr. S. C. Brown	2,000
Rocklin, Dr. A. M. Stafford	800
Roseville, Dr. Wm. Bolton	800
Sacramento, Dr. H. L. Nichols	30,000
San Diego, Dr. D. Gochenauer	21,000
San Francisco, Dr. J. W. Keeney	300,000
San José, Dr. J. R. Curnow	25,000
Santa Maria, M. Thornberg, H. O.	1,000
San Pedro, Dr. R. W. Hill	1,500
Santa Ana and vicinity, Dr. J. G. Bailey	15,000
Santa Barbara, Dr. R. F. Winchester	5,849
Santa Cruz and vic., Dr. C. L. Anderson	7,000
Santa Rosa, Dr. J. S. Sargent	5,500
Sausalito, Dr. H. J. Crumpton	1,500
Santa Paula, Dr. M. F. Patten	2,000
Shasta, Dr. J. M. Briceland	400
Stockton, Dr. C. A. Ruggles	15,000
Soquel, Dr. H. O. Brink	400
St. Helena, Dr. W. J. G. Dawson	1,800
Suisun, Dr. J. W. B. Reynolds	1,000
Truckee and vicinity, Dr. W. Curtless	1,300
Tulare City, Dr. C. F. Taggart	3,500
Valejo, Dr. W. D. Anderson	6,000
Vacaville and Elmira, Dr. J. W. Stitt	4,500
Visalia, Dr. C. E. Bernhard	3,000
Watsonville, Dr. W. D. Rodgers	2,500
Wheatland, Dr. L. Melton	700
Williams, Dr. A. W. Kimball	600
Woodland, Dr. T. Ross	4,000
Totals	752,759

DECEMBER, 1890.

Mortality reports received from 93 localities in different parts of the State, with an estimated population of 744,169, give the number of decedents as 1,196, being a monthly percentage of 1.67 per 1,000, or an annual mortality of 20.04, which is a higher death rate than that of the preceding month, and the largest death rate we have had since January of last year, when epidemic influenza gave us a like increased percentage of mortality. The increased death rate during December was owing to the increase and fatality of diseases of the respiratory organs, including diphtheria and croup.

CONSUMPTION caused the death of 169 persons, which is an exceptionally large mortality for the month.

PNEUMONIA was credited with 140 deaths, which is a large increase over the deaths in November, when the mortality was considered quite high from this disease.

BRONCHITIS caused 28 deaths, a slight increase over the preceding month.

CONGESTION OF THE LUNGS was reported fatal in 9 instances only.

WHOOPIING-COUGH was fatal in but 1 instance.

DIPHTHERIA is credited with 63 deaths, which is an increased mortality over that of November. Thirty-three of these deaths occurred in San Francisco, 6 in Alameda, 9 in Los Angeles, 2 in El Monte, 2 in Oakland, 2 in College City, 2 in Santa Ana, and 1 each in Antioch, Downey, Modesto, Sacramento, Santa Cruz, Sausalito, and Stockton.

CROUP, so closely allied to diphtheria as to be almost synonymous with it, caused 35 deaths. Of these, 20 occurred in San Francisco, 2 each in Los Angeles, Sausalito, San José, Sacramento, College City, and 1 each in Folsom, Haywards, Pasadena, Stockton, and Woodland.

CHOLERA INFANTUM.—The mortality from this disease has decreased, 12 deaths only being attributed to it.

DIARRHŒA AND DYSENTERY were fatal in but 9 instances, which is also a decrease.

SCARLET FEVER caused but 2 deaths, 1 in Eureka and 1 in Sacramento.

MEASLES was fatal in 1 instance.

SMALLPOX caused 3 deaths, all in San Francisco.

TYPHO-MALARIAL FEVER was fatal in 5 instances.

TYPHOID FEVER is credited with 31 deaths, which is a slight decrease from the mortality from this cause last month.

REMITTENT AND INTERMITTENT FEVERS are reported to have caused 5 deaths.

CEREBRO-SPINAL FEVER is credited with 5 deaths.

ERYSIPELAS caused but 3 deaths.

CANCER was fatal in 34 instances.

HEART DISEASE caused 84 deaths.

ALCOHOLISM caused the large number of 28 deaths.

DEATHS FROM CAUSES not classified in this abstract, 478.

PREVAILING DISEASES.

Reports of sickness from 100 localities in different parts of the State indicate a continued increase of sickness. Inflammatory affections of the chest and bowels seem to be particularly prevalent. This is probably owing to the changes in temperature during the month of December, together with the severe storms, and, in many places, damp fogs that were quite trying to many persons.

INFLUENZA was quite prevalent throughout the State. The form is much milder than that of last December, and, as a rule, is less depressing and debilitating. It may, however, take on a severer form during the present month, and increase our mortality returns.

PNEUMONIA was quite prevalent during the month, and of a very fatal character. It was noticed in reports from Ione, Bakersfield, Alameda, Anaheim, Antioch, Azusa, Pleasanton, Salinas, Hollister, Mariposa, College City, Berkeley, Colton, Cottonwood, Chico, Millville, Etna Mills, El Monte, Alturas, Downey, Lakeport, Galt, Redding, Lockeford, Gridley, Downieville, Grass Valley, Haywards, Los Angeles, Modesto, Sacramento, San José, San Francisco, Santa Ana, Santa Rosa, Vallejo, Watsonville, Calico, St. Helena, Biggs, and Stockton. The sudden onset of this disease and the rapidity of its course, mark it as one requiring prompt medical treatment if we would save life. The commonest cause of its development is the transit of the heated body into a cold atmosphere, or, quite as common, is the chilled body introduced into a dry and heated air; in both cases a congestion of the lungs is induced, which may be only temporary, and pass away, or, in those susceptible to inflammatory diseases, may develop into a pneumonia which will speedily terminate life. The preventive measures are, never to go from a hot room into the cold air without the intervention of a woolen or silk muffler over the mouth and nose, through which the air may be warmed before entering the lungs. If we would take the commonest sanitary precautions in our adaptations to changes of temperature, we would escape many affections of our lungs which we now largely invite by gross carelessness and inattention to hygienic rules.

BRONCHITIS prevailed quite as extensively as pneumonia, but its type was not so severe. It was noted as observed in almost every report received, and, in some places, was almost epidemic in form.

WHOOPIING-COUGH was noticed in San Francisco, North San Juan, Lincoln, Elk Grove, Sacramento, and Cloverdale. The type of this disease was mild, its persistence being the most notable feature of its presence.

DIPHTHERIA AND CROUP were quite prevalent, being noted in reports from San Francisco, Alameda, Sacramento, Salinas, Los Angeles, Antioch, College City, Lodi, Visalia, Eureka, Benicia, Etna Mills, Elk Grove, Downey, Sausalito, Truckee, Middletown, Pacific Grove, Anaheim, Williams, Lockeford, El Monte, Modesto, Oakland, Ontario, Santa Ana, San José, Stockton, Woodland, Folsom, and San Francisco.

SCARLET FEVER, in a mild form, was observed in Sacramento, Contra Costa County, Blacks, Eureka, Azusa, College City, Middletown, Galt, and San Francisco.

MEASLES was noted in San Francisco, Sacramento, Colton, Pleasanton, and Ontario.

SMALLPOX.—There were a few cases of smallpox in San Francisco during December. There is only one case now in the pesthouse, and he is convalescent. No further trouble is anticipated with the disease, except it is again imported and concealed. San Francisco is so well vaccinated that smallpox can make no headway among its inhabitants. If our vaccination law were enforced, the same might be said of the whole State.

ERYSIPELAS, in sporadic form, was noted in Sacramento, Concord, Salinas, Ontario, Lincoln, Hollister, Truckee, Etna Mills, Cottonwood, Oakdale, Brownsville, Alameda, and Grass Valley. The type was mild, with very limited mortality.

TYPHOID FEVER did not prevail to the extent we would expect at this season of the year. Sporadic cases were reported in Bakersfield, North San Juan, Salinas, Igo, Mariposa, Visalia, Etna Mills, Lakeport, Redding, Galt, Wheatland, Gridley, Alameda, Fresno, Lake, Los Angeles, Oakland, Orland, Redding, San José, Santa Ana, Santa Barbara, San Diego, Santa Paula, Vacaville, and San Francisco.

TYPHO-MALARIAL FEVER.—A limited number of cases of this disease were reported in College City, San Pedro, Truckee, Redding, Wheatland, Oakland, Fresno, and San Francisco.

REMITTENT AND INTERMITTENT FEVERS are not very prevalent at present. They were noted in reports from Ione, Bakersfield, Visalia, Truckee, Knights Ferry, Wheatland, Los Angeles, Marysville, and Fresno. As these fevers are more or less under the influence of meteorological conditions, we may expect the continuance of cold weather to lessen their prevalence in a marked manner.

CEREBRAL FEVER was reported in a few instances in North San Juan, San Pedro, Downey, Knights Ferry, Wheatland, Anaheim, Gridley, Rocklin, and San Francisco.

We desire this month to call the attention of every Health Officer to the necessity of having all premises containing or having contained cases of infectious disease, properly fumigated and disinfected under their supervision, and to discourage, or, if possible, forbid the holding of a public funeral in every case of scarlet fever or diphtheria. Day by day we are called upon to record cases of disease contracted in this way. A general law should be passed making it a penal offense to fail to notify the public, by some distinctive flag or notice, of the presence of communicative disease, and any one holding a public funeral, where the cause of death is infective, should be severely punished.

PACIFIC COAST WEATHER SUMMARY.

The month of December has been distinguished by the following important features: (1) The extreme southerly movement of the heavy storm of 2d to 5th. (2) Heavy and continuous fogs in Northern California, 7th to 30th. (3) The barometric trough from the Washington coast southeastward to central Nevada attending the storm of 29th and 30th. (4) Heavy storms at sea, off the Washington coast, on 3d, 4th, 14th, 17th, 18th, and 25th. (5) The heavy storm of the 25th, in northern Oregon and Washington, causing much destruction of property in various cities, especially Seattle. (6) Warm weather in southwestern California, 6th to 30th. (7) General deficiency in rainfall. (8) Frosts in Southern California and southern Arizona. (9) The large number of cyclonic areas passing eastward north of Washington. (10) The high barometer in Nevada, 8th to 28th. In connection with the development of fogs during the month, it is important to note that they prevailed during the period of high barometer in northern Nevada. This high pressure began immediately upon the disappearance of the heavy storm in the first week of the month, and was dissipated by the formation of the barometric trough on the 29th and 30th, which latter date marks the termination of the heavy fog period. Under the influence of this high pressure area in northern Nevada, cold northerly winds and fogs prevailed in Northern California, and warm northerly winds in Southern California, which condition illustrates the extreme heating effect of the desert regions of southeastern California upon the air which passes over them.

RAINFALL.—There has been a general deficiency of rainfall, except a slight excess in the San Joaquin Valley and in southern Arizona. Of the eleven cyclonic areas which appeared off Vancouver Island during the month, all passed eastward north of Washington except two, one of which reached southward into the extreme northern portion of California, and the other passed eastward across northern Washington. This high latitude of the eastern movement of the storm areas explains the deficiency in rainfall. The deficiency ranges from .18 of an inch at Keeler to 4.01 at Portland, and is most marked in Oregon. The deficiency in California varies from .43 of an inch at Los Angeles to 1.96 inches at San Francisco. The rainfall at San Francisco during a period of forty-two years has been less than the present amount (3.25 inches) during fourteen previous Decembers. The smallest amount in a period of forty-two years was a trace in 1876. The next smallest amount was .33 in 1874, and .58 in 1865 and 1878. The excess in southern Arizona is .12 of an inch at Yuma and .30 at Fort Grant. The excess in the San Joaquin Valley is 1.02 inches at Fresno. The heaviest rainfall in twenty-four hours was 2.74 inches on the 21st at Olympia, at which station, also, the heaviest monthly rainfall

(8.10 inches) occurred. Rain fell in Washington 1st to 6th, 10th to 15th, 17th to 25th, 28th to 31st; snow on 20th. Oregon, 1st to 4th, 6th, 10th to 25th, 29th to 31st; snow, 4th, 5th, 30th, 31st. California, 2d to 5th, 10th to 14th, 18th to 20th, 21st, 23d, 25th, 28th to 31st; snow, 2d to 5th, 18th, 19th, 30th, 31st. Nevada, 2d to 5th, 19th, 30th, 31st; snow, 2d to 5th, 8th, 13th, 19th, 20th, 30th, 31st. Arizona, 4th to 6th, 10th, 11th, 18th, 30th, 31st; snow, 5th.

LOCAL STORMS.—Thunder storms: Astoria, Oregon, 19th; Sacramento, 3d; Port Angeles, Washington, 20th; with snow, hail storms, Sacramento, 3d, Stockton, 30th. The highest wind velocity at Fort Canby was 52 miles southeast 2d, 52 southeast 14th, 60 south 18th, 56 southwest 19th, 64 southwest 21st, 44 south 23d, 48 southeast 10th. At San Francisco the maximum velocity was 43 miles southwest on 3d.

TEMPERATURE.—It has been generally above the normal, except in Northern California, where the deficiency ranges from 1° to 4°. The excess is most marked in Southern California, southern Arizona, and eastern Washington, where the amount ranges from 7° to 9°. The highest temperature, 82°, occurred at Los Angeles on the 26th. The lowest, 12°, occurred at Winnemucca on the 10th and 12th.

Abstract of the Reports of Deaths and their Causes in California during December, 1890.

LOCATIONS AND AUTHORITIES.	Estimated Population	Deaths																										
		Other Causes	Alcoholism	Heart Diseases	Erysipelas	Cancer	Cerebro - Spinal Fevers	Remittent and Intermittent Fevers	Typhoid Fever	Typho - Malarial Fever	Whooping-Cough	Smallpox	Measles	Scarlet Fever	Croup	Diphtheria	Other Diseases of Stomach & Bowels	Cholera Infantum	Diarrhoea and Dysentery	Congestion of the Lungs	Acute Bronchitis	Acute Pneumonia	Consumption	Total Deaths				
Alturas, Dr. J. M. Forrest	2,250	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	2	1	1
Alameda, Dr. John I. McLean	11,250	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
Anaheim, Dr. J. H. Bullard	2,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Anderson, Dr. O. P. Paulding	1,500	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Antioch, Dr. W. S. George	3,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Azusa and vicinity, Dr. J. H. Miller	2,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bakersfield, Dr. C. A. Rogers	3,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Benicia, Dr. E. Gray	2,800	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Berkeley, Dr. F. H. Payne	4,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Blacks, Dr. F. M. Stratton	1,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Biggs, Dr. O. C. Hawkins	2,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Brownsville, Dr. L. C. Crossman	800	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Calico, Dr. A. R. Rhea	1,800	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
College City and vic., Dr. C. H. Gibbons	700	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cedarville, Dr. B. Woodbridge	1,500	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Colton, Dr. M. F. Price	2,500	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cottonwood, Dr. J. O. Smith	1,200	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cloverdale, Dr. H. S. Markell	1,700	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chico and vicinity, Dr. W. King	10,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Downville, Dr. A. Jump	1,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Downey and vicinity, Dr. Q. J. Rowley	2,500	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Etta Mills, Dr. L. W. Bathurst	750	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Elk Grove, Dr. J. A. McKee	500	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
El Monte, Dr. F. P. Cave	800	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eureka, Dr. S. B. Foster	10,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Elsinore, Dr. T. E. Ellis	1,200	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Forest Hill and vic., Dr. Paul Rundy	3,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fresno, Dr. T. M. Hayden	9,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Folsom, Dr. B. F. Bates	1,500	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Galt, Dr. A. Montague	2,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grass Valley, Dr. W. C. Jones	6,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gonzales, C. A. E. Hertel	500	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gridley, Dr. J. T. Harris	1,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

[illegible][illegible]

JANUARY, 1891.

Mortality reports received from 94 localities in different parts of the State, with an estimated population of 736,100, give the number of decedents as 1,213, being a monthly percentage of 1.64+, or an annual mortality of 19.68, which is a fraction lower than the percentage of December, but still much larger than usual. The continued high mortality is attributable to the prevalence of diseases of the respiratory system, the advent of a fresh epidemic of la grippe, with the extensive diffusion of diphtheria and croup.

CONSUMPTION exemplifies the epidemic influence that prevails with the increased mortality of 193 deaths in January.

PNEUMONIA is credited with 138 deaths, about the same as reported in the previous month.

BRONCHITIS caused 47 deaths, which is nearly double that of December.

CONGESTION OF THE LUNGS was fatal in 19 instances.

WHOOPING-COUGH caused 3 deaths.

DIPHTHERIA was fatal in 65 instances; of these, 38 occurred in San Francisco, 4 in Los Angeles, 3 each in Sacramento, Alameda, Rio Vista, and Santa Cruz; 2 each in Visalia, San José, El Monte, and Napa; and 1 each in Anaheim, Merced, and Santa Ana.

CROUP also shows a mortality of 92, which is a decrease from the report in December of these deaths. Sixteen occurred in San Francisco, 2 in San Diego, 1 each in College City, Long Beach, Napa, and Santa Ana.

CHOLERA INFANTUM is credited with 4 deaths only.

DIARRHŒA AND DYSENTERY likewise caused but 4 deaths, which is a remarkably small mortality, considering the frequency of the disease.

SCARLET FEVER caused but 4 deaths, 2 of them in San Francisco, 1 in San Diego, and 1 in Colton.

MEASLES was fatal in but 1 instance, in San José.

TYPHO-MALARIAL FEVER is credited with but 2 deaths.

TYPHOID FEVER was reported as causing but 20 deaths, which is an exceedingly low mortality for this disease, considering its prevalence. The type is evidently of a mild character.

REMITTENT FEVER caused only 3 deaths.

CEREBRO-SPINAL FEVER is credited with 9 deaths, which is a slight increase over last month.

ERYSIPELAS caused 7 deaths, which is an increase over last report.

CANCER was fatal in 37 instances.

HEART DISEASE was credited with 98 deaths.

ALCOHOLISM caused 14 deaths.

DEATHS FROM CAUSES not classified in this abstract, 458.

PREVAILING DISEASES.

Reports received from 94 localities in different parts of the State indicate that sickness is still prevalent, although not more so than in December, if we except those diseases affecting the respiratory system. There is no doubt that inflammatory disease of the lungs prevails extensively throughout the State, and that another epidemic of la grippe is fast developing. The particular feature about epidemic influenza this winter is the great tendency it exhibits to pass from the air tubes into the air cells, thus constituting pneumonia, which in many cases it does so quietly that to an ordinary observer it is unnoticed until death steals upon its victim. As a matter of wise precaution all cases of la grippe should be brought under the notice of a reputable physician before they have advanced to a dangerous stage of the malady, as *latent pneumonia*, which can only be detected by a skilled practitioner, may be advancing. The absence of the usual rainfall in January, together with the cold nights and fogs, seemed to have some influence in determining the frequency of coughs and colds, of which most every one complained. Disorders of the alimentary canal were not so frequently reported as in December, and no zymotic disease prevailed in an epidemic form.

CHOLERA INFANTUM.—Sporadic cases of this disease were reported in Merced, Santa Ana, North San Juan, and Monterey. It is not at all prevalent.

DIARRHŒA AND DYSENTERY were observed with some frequency in Visalia, College City, Knights Ferry, Bakersfield, San Pedro, Brownsville, Needles, Elsinore, Gridley, Kelseyville, Fresno, El Monte, Downey, and San Diego.

SMALLPOX.—A single case was reported from Humboldt County, but no particulars were received as to its origin.

VARICELLA, OR CHICKENPOX, was reported in Mariposa and Sacramento.

MEASLES was prevalent during the month in Pleasanton, Williams, Lockeford, Vacaville, Fresno, Alturas, Downey, Merced, Santa Cruz, San José, and Sacramento.

SCARLET FEVER was reported in San Diego, Hollister, Sacramento, San Francisco, Colton, Oakdale, El Monte, Napa, Middletown, Santa Cruz, Pacific Grove, Dixon, College City, and Modesto. In San Diego Dr. T. L. Magee reports that the disease was very mild, and that among the 84 cases notified at the Health Office only one death occurred. In Dixon the disease was almost epidemic, but no fatality resulted from it.

DIPHTHERIA AND CROUP.—Sporadic cases of these diseases were observed in many localities—Visalia, Eureka, Truckee, Napa, Azusa, Santa Ana, Downey, Los Angeles, San Diego, College City, San Luis Obispo, Anaheim, Sacramento, San José, San Francisco, Fresno, Mariposa, Pacific Grove, Santa Cruz, Modesto, Merced, Lodi, El Monte,

and Alameda. The disease reported by the press in Antelope Valley consisted in a limited outbreak in one family, the mother and three children being seized with it. According to the report of Dr. Fife, the disease was exceptionally malignant, proving fatal to the three children, the mother recovering. The source of the disease was supposed to be a child living in Antelope that died suddenly of some throat trouble, the nature of which was not known. From this the lesson may be learned that the simplest sore throat requires attention, as what may seem to be quite innocent in its nature may give rise to the most malignant and fatal disease. At the International Medical Congress the question was asked, "How long can a diphtheritic patient furnish infectious excretions?" In reply to this it was stated that excretions were found infectious three weeks after apparent recovery, and pieces of membrane yielded cultures fourteen weeks after discharge from the throat. Children having had the disease should therefore be kept from school for at least four weeks after recovery, and every article of apparel worn by them should be thoroughly disinfected. All doubtful cases of throat disease should be treated as diphtheritic until the contrary is clearly shown; by this means a danger would be averted that under any course might be imminent.

WHOOPING-COUGH is abating; a few cases were observed in Sacramento.

ERYSIPELAS was reported in Sacramento, College City, Knights Ferry, Bakersfield, Etna Mills, Fresno, Downey, San Francisco, Dixon, and Modesto. The type was generally mild.

TYPHOID FEVER is not prevalent in any part of the State. Some sporadic cases were reported in San Francisco, Eureka, Bakersfield, Etna Mills, Igo, Lockeford, Santa Ana, Fresno, Sacramento, Merced, Calico, El Monte, and Cedarville. The type is mild so far as heard from.

TYPHO-MALARIAL FEVER was reported in Visalia, College City, Knights Ferry, Redding, Oakdale, San Pedro, Cottonwood, Galt, Gridley, Merced, and Wheatland.

CEREBRAL FEVER.—Sporadic cases of this disease were observed in Redding and Napa. PNEUMONIA was reported as present in Eureka, Pleasanton, Biggs, Bakersfield, Igo, Etna Mills, Truckee, Benicia, Redding, Brownsville, Lockeford, San José, Galt, College City, Anderson, Watsonville, Gridley, San Luis Obispo, Anaheim, Fresno, Alturas, Shasta, Dixon, Wheatland, Merced, San Francisco, Alameda, Oakland, and Sacramento.

BRONCHITIS was prevailing to a greater or less extent in every precinct heard from.

INFLUENZA appears in almost every report. In some places it is quite epidemic, and partakes of all the characteristics of la grippe, being attended by debility and great prostration. In many cases it is preliminary to a low form of pneumonia, which is said to be particularly fatal, owing to the depressing influences of the accompanying influenza.

PACIFIC COAST WEATHER SUMMARY.

The month of January has been notable for the following important features: (1) The high latitude of the easterly movement of cyclonic areas. (2) Although the approximate paths of 8 cyclones have been charted for the month, in no case did the center of any storm reach southward into Washington. (3) The marked deficiency in precipitation throughout the Pacific Coast States. (4) General increase in temperature in all districts, especially in Washington. (5) The periods of fair weather in Washington and Oregon from the 7th to the 14th, and from the 19th to the 23d, when this region was occupied by an anti-cyclone. (6) The slow movement of the cyclonic areas of the month, especially the storm of the 14th to 19th, which required nearly 5 days to pass eastward beyond Washington. (7) The period of high northerly winds in California from the 25th to 30th, when the velocities ranged from 25 to over 40 miles per hour at many places. During this time an anti-cyclone was central on the northwest coast of California and the southwest coast of Oregon. (8) The peculiar development of the cyclone of the 29th to 31st. This storm appeared to remain almost stationary over British Columbia, but with a remarkable influence in diminishing barometric pressure to the southward, without apparently changing the location of its center. The barometer fell slowly but constantly for three days, from Mexico to British America, culminating on the night of the 31st in light rains, with snow in mountains in California, Nevada, Oregon, and Washington. (9) The development of a huge waterspout off the mouth of the Columbia River on the 5th in the southeast current of the cyclone then central off Vancouver's Island. This cyclone first appeared on December 31st last, and remained in the vicinity of Washington until January 6th. The waterspout was reported as of remarkable size and power, moving from southwest to northeast, attended by a loud, roaring noise. It seemed to possess the characteristics of a veritable tornado, and would undoubtedly have caused considerable destruction to property, and perhaps life, if it had passed over the land. (10) The heavy and continuous gales off the Washington coast, especially from the 14th to the 19th, during which time the average daily maximum velocity at Fort Canby was nearly 50 miles per hour. (11) The heavy rains, turning to snow in mountains, in Southern California and southern Arizona on the 28th and 29th, resulting from the high northerly winds and low temperatures—San Diego 1.08 inches of rain and Fort Grant 3 inches of snow.

RAINFALL.—The rainfall has been deficient in all districts, especially in Northern California and western Oregon. The deficiency ranges from .25 of an inch at Keeler to 7.78 inches in Eureka, 4.57 inches at Red Bluff, and 4.08 inches at San Francisco. The rainfall at San Francisco has not been so small since 1852, when the amount reported was .58 of an inch. In 1851 the amount was .72 of an inch. The rainfall for January, 1891, is .98 of an inch. In January, 1862, there was recorded 24.36 inches—the heaviest rainfall ever

reported for San Francisco. The largest monthly rainfall was 6.60 inches, at Fort Canby. No rain fell at Keeler and Yuma. The heaviest rainfall in 24 hours was 1.08 inches at San Diego on the 28th and 29th. Rain fell on 22 days in Washington; in Oregon, 24 days of rain and 5 days of snow; in California, 19 days of rain and 13 of snow; Nevada, 10 days of rain and 17 days of snow; in Arizona, 4 days of rain and 4 days of snow. Local storms: Astoria, Oregon, 2d, thunder, lightning, and hail.

TEMPERATURE.—It has been above the normal in all the districts except northern Nevada, where the deficiency is only 1° at Winnemucca. The excess is most marked in Washington, northern Oregon, and southwestern California, where it ranges from 4° to 13°. The highest temperature, 80°, occurred at Los Angeles, 23d. The lowest, 18°, at Halleck and Carlin, Nevada, 10th.

Abstract of the Reports of Deaths and their Causes in California during January, 1891.	
LOCATIONS AND AUTHORITIES.	
Alturas, Dr. J. M. Forrest.....	2,250
Alameda, Dr. John T. McLean.....	12,250
Antioch and vicinity, Dr. W. S. George.....	3,000
Anaheim, Dr. J. H. Bullard.....	2,000
Anderson, Dr. O. P. Paulding.....	1,500
Auburn, Dec. and Jan., A. F. Waldo, H. O.....	1,600
Azusa and vicinity, Dr. J. H. Miller.....	2,000
Bakersfield, Dr. C. A. Rogers.....	3,400
Benicia, Dr. E. Gray.....	2,400
Brownsville, Dr. L. C. Crossman.....	800
Biggs, Dr. O. C. Hawkins.....	2,000
Calico, Dr. A. R. Rhea.....	600
Cedarville, Dr. B. Woodbridge.....	1,500
Colton, Dr. M. F. Price.....	2,000
College City, Dr. C. H. Gibbons.....	700
Colfax, Dr. C. N. Miner.....	1,000
Cottonwood, Dr. J. O. Smith.....	1,250
Chico and vicinity, Dr. W. King.....	10,000
Dixon, Dr. A. Trafton.....	2,500
Downeyville, Dr. A. Jump.....	1,000
Downey and vicinity, Dr. Q. J. Rowley.....	2,500
Elma Mills, Dr. L. W. Bathurst.....	750
Elk Grove, Dr. J. A. McKee.....	500
Eureka, Dr. S. B. Foster.....	10,000
Elsinore, Dr. T. E. Ellis.....	500
El Monte, Dr. F. P. Cave.....	800
Forest Hill and vicinity, Dr. Paul Reudy.....	3,000
Fresno, Dr. T. M. Hayden.....	10,000
Folsom, Dr. B. F. Bares.....	1,500
Galt, Dr. A. Montague.....	2,000
Grass Valley, Dr. W. C. Jones.....	6,000
Gonzales, Dr. C. A. E. Herzel.....	1,500
Grover, Dr. J. T. Harris.....	1,500
Other Causes.....	0
Alcoholism.....	0
Heart Diseases.....	0
Erysipelas.....	0
Cancer.....	0
Cerebro - Spinal Fevers.....	0
Remittent and Intermittent Fevers.....	0
Typhoid Fever.....	0
Typho - Malarial Fever.....	0
Whooping-Cough.....	0
Smallpox.....	0
Measles.....	0
Scarlet Fever.....	0
Croup.....	0
Diphtheria.....	0
Other Diseases of St'mach & Bow'ls.....	0
Cholera Infantum.....	0
Diarrhoea and Dysentery.....	0
Congestion of the Lungs.....	0
Acute Bronchitis.....	1
Acute Pneumonia.....	1
Consumption.....	0
Total Deaths.....	2
Estimated Population.....	12,250

ABSTRACT FOR JANUARY, 1891—Continued.

LOCATIONS AND AUTHORITIES.	Estimated Population	Total Deaths	Consumption	Acute Pneumonia	Acute Bronchitis	Congestion of the Lungs	Diarrhoea and Dysentery	Cholera Infantum	Other Diseases of St'mach & Bow'ls	Diphtheria	Croup	Scarlet Fever	Measles	Smallpox	Whooping-Cough	Typho - Malarial Fever	Typhoid Fever	Remittent and Intermittent Fevers	Cerebro - Spinal Fevers	Cancer	Erysipelas	Heart Diseases	Alcoholism	Other Causes
Hanford, Dr. J. A. Davidson	1,500	2	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Haywards, Dr. G. E. Alexander	1,200	5	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
Healdsburg, Dr. N. B. Coffman	4,000	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hollister, Dr. J. H. Tebbetts	1,500	5	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Igo, Dr. H. Schafer	600	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ione and vicinity, Dr. A. L. Adams	1,800	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Knights Ferry, Dr. J. H. Lowe	250	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lockeford, Dr. E. N. Foote	500	6	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Lincoln, A. C. Fleming, H. O.	1,000	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lake County, Dr. S. R. Mather	7,000	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Long Beach, Dr. J. W. Wood	2,000	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lodi, Dr. E. A. Burchard	1,200	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lorin, Dr. E. J. Ashmore	500	4	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Los Angeles, Dr. G. MacGowan	60,000	85	22	10	3	1	0	0	3	4	0	0	0	0	0	0	0	0	0	0	0	0	0	32
Marysville, Dr. D. Powell	5,000	8	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
Merced, Dr. E. S. O'Brien	2,500	7	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
Mariposa, Dr. W. J. Kearney	1,000	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
Middletown, Dr. E. E. Hartley	500	4	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Monterey, Dr. O. S. Trimmer	3,000	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Napa, Dr. M. B. Pond	5,000	8	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nevada City, Dr. F. R. Waggoner	5,000	7	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Needles, Dr. J. P. Booth	700	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
North San Juan, Dr. G. S. Farley	500	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Oakland, Dr. D. D. Crowley	60,000	72	9	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	28
Oakdale, Dr. R. H. Endicott	1,000	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Oroville, Dr. J. H. M. Karsner	2,000	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Orland, Dr. W. Thurston	3,500	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pasadena and vicinity, Dr. H. H. Sherck	10,000	9	5	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Petaluma, Dr. L. H. Petty	8,000	5	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pleasanton, Dr. W. H. Cope	1,200	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rio Vista, Dr. S. C. Brown	1,900	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Redding, Dr. F. F. Mitchell	3,000	10	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Riverside, Dr. W. B. Sawyer	5,000	9	4	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2

Roseville, Dr. Wm. Bolton	800	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Sacramento	30,000	36	7	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14
Salinas City, Dr. May Gydison	2,700	5	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
San Benito County, Dr. J. H. Tebbetts	8,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
San Diego, Dr. T. L. Magee	16,000	21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11
San Francisco, Dr. J. W. Keeney	30,000	612	87	3	14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	224
San José, Dr. J. R. Curnow	25,000	61	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	24
San Pedro, Dr. R. W. Hill	1,500	2	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Santa Ana and vicinity, Dr. J. G. Bailey	15,600	17	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Santa Monica, Dr. E. C. Folsom	1,500	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Santa Maria, Dr. M. Thornberg	1,500	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Santa Cruz, Dr. C. L. Anderson	7,000	10	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Selma, Dr. E. E. Brown	1,500	5	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Shasta, Dr. J. M. Briceland	600	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Soquel, Dr. H. O. Brink	600	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Stockton, Dr. C. A. Ruggles	14,400	18	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10
Suisun, Dr. J. W. B. Reynolds	1,000	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Truckee and vicinity, Dr. W. Curless	1,300	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Vallejo, Dr. W. D. Anderson	6,000	9	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Vacaville and Elmira, Dr. J. W. Stitt	4,500	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Visalia, Dr. C. E. Bernhard	3,500	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Watsonville, Dr. W. D. Rodgers	2,500	4	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Wheatland, Dr. L. Melton	900	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Williams, Dr. A. W. Kimball	600	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Woodland, Dr. T. Ross	4,000	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Yreka, George Britter, Recorder	1,500	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	736,100	1,213	193	138	47	19	4	4	62	65	22	4	1	0	2	2	29	3	9	37	7	98	14	453

FEBRUARY, 1891.

Mortality reports received from 85 localities in different parts of the State, with an estimated population of 721,991, give the number of decedents as 1,150, being a monthly percentage of 1.66, or an annual mortality of 19.92, which is a higher percentage than that of January, and shows a continued high death rate for California. This must be attributed to the great prevalence of diseases of the respiratory system, as with the exception of diphtheria, croup, and influenza, no infectious zymotic disease is prevailing.

CONSUMPTION caused 167 of these deaths, which is a decrease of 26 from the mortality of this disease in January.

PNEUMONIA increased its death rate from 138 deaths in January to 160 in February.

BRONCHITIS caused 44 deaths, which is also a high mortality from this disease.

CONGESTION OF THE LUNGS was credited with 18 deaths.

WHOOPING-COUGH was fatal in 4 instances.

DIPHTHERIA is credited with 61 deaths. Of these 38 occurred in San Francisco, 6 in Red Bluff, 4 in Napa, 2 each in Oakland, Los Angeles, Azusa, College City, and Hanford, and 1 each in Modesto, National City, and San José.

CROUP caused 26 deaths—23 in San Francisco, 1 each in El Monte, San José, and Sacramento.

CHOLERA INFANTUM was the cause of only 1 death, which is an evidence of its almost complete absence from the State.

DIARRHŒA AND DYSENTERY are likewise to be noted by their absence, 3 deaths only being recorded from them.

SCARLET FEVER, although quite prevalent in a mild form, caused no deaths.

MEASLES caused 4 deaths in Stockton.

SMALLPOX is absent from the State.

TYPHO-MALARIAL FEVER has only 2 deaths credited to it.

TYPHOID FEVER had the remarkably small mortality of 7 attributed to it. Six of these deaths occurred in San Francisco and 1 in Napa. The limited death rate from this disease may perhaps be attributed to the cleansing of foul sewers and filthy places by the copious rains which visited us during the month. In all events, it is worthy of note.

REMITTENT FEVER caused only 1 death.

CEREBRO-SPINAL FEVER is credited with 7 deaths.

ERYSIPELAS was fatal in but 2 instances.

CANCER caused 33 deaths.

HEART DISEASE was fatal in 100 cases.

ALCOHOLISM caused 9 deaths.

DEATHS FROM CAUSES not classified in this abstract, 445.

PREVAILING DISEASES.

Reports of sickness received from 96 localities in different parts of the State continue to indicate an abnormal amount of illness from those diseases affecting the respiratory system. The bowel disorders, which were so prominent a feature in previous reports, seem to have, in a great measure, subsided, being infrequently mentioned in our disease returns. Even cholera infantum remains unreported. The rainfall being copious during the month, had the salutary effect of flushing and washing the choked drains and sewers, carrying away much decomposing organic matter, the most prolific source of alimentary disorders. To it may be attributed the improved health of the community in its relation to bowel diseases, but how much the increased humidity has contributed to the prevalence of influenza and other diseases of the chest and lungs, it may be difficult to conjecture.

PNEUMONIA prevailed almost everywhere throughout the State. It was reported in some localities as partaking of an epidemic character, and in several instances appeared to be really infectious. One of our Health Officers reports an instance in which the father, mother, brother, and two sisters took the disease, one after the other, in the same house, both parents dying. It was noted in San Francisco, Oakland, Sacramento, Los Angeles, San José, Stockton, Marysville, Grass Valley, Downieville, Red Bluff, Etna Mills, Shasta, Modesto, Merced, San Diego, National City, Salinas, Kelseyville, Watsonville, Middletown, Redding, Truckee, Needles, Pleasanton, Alameda, Downey, Roseville, Hanford, Auburn, Anaheim, Benicia, Bakersfield, Jackson, and Fresno.

BRONCHITIS also prevailed to an alarming extent. The type, however, was not of a serious character, its universality being the most distinguishing feature of its presence.

WHOOPING-COUGH was reported in Sacramento, Elk Grove, Etna Mills, Truckee, Rocklin, Sausalito, San Francisco, Oakland, Salinas, Marysville, and Davisville.

DIPHTHERIA AND CROUP were also reported as present during the month in Sacramento, San Francisco, San José, Fresno, Napa, Modesto, Elk Grove, Hanford, College City, Azusa, Los Angeles, Red Bluff, El Monte, Truckee, Sausalito, Rio Vista, National City, and Merced. We believe that the spread of this disease might be materially lessened if the public could be taught to look upon it as it does upon smallpox, and take the same precautions in isolating its victims as it does those of the more loathsome disease, which, while disagreeable to wait upon, is not half so deadly in its results as the diphtheritic poison. Another point upon which it might be well to inform the public is, that where an infectious or contagious disease occurs in a home, and the washing of the patient's bedding or clothing is sent away to be washed without first having them thor-

oughly disinfected, and the washerwoman or any of her family thereby become infected, they can recover damages in a Court of law, if not previously notified or warned that the clothing is infected. A few successful suits of this kind would engender caution and a realization of the fact that public protection must be afforded against infectious disease.

SCARLET FEVER was quite prevalent during the month in many parts of the State. This is a disease that can be effectually quarantined against. Dr. M. F. Price, our Health Officer at Colton, writes: "The epidemic of scarlet fever with which we were threatened the first of the month was *effectually prevented* by strict isolation and quarantine. Only the first four cases occurred. The wisdom of the State and city health laws, with an officer empowered to enforce them, was fully demonstrated in this instance." Dr. T. L. Magee, Health Officer at San Diego, says: "Scarlet fever has almost entirely disappeared by strict isolation and quarantine of those affected." In the southern portion of Sacramento a public school had to be closed, the disease became so prevalent. In this disease, as in smallpox, the poison is given off from the bodies of the sick, and as we have no knowledge of any mode of protection corresponding with vaccination, the obvious means, therefore, of avoiding contagion, is to keep out of reach of the infection by the sick, or of articles infected by them. The difficulty of doing this can be estimated when we learn of the persistence of the vitality of the poison. It is communicable during the whole of the illness and convalescence of the patient. Infected clothing that has been packed away for months may communicate the disease and the instances are numerous where the infection has been carried long distances from the sick by healthy persons who have recently come in contact with scarlet fever. All these facts point to the most rigid exclusion of susceptible children from every possible source of infection.

MEASLES was epidemic in Stockton. Dr. C. A. Ruggles writes that in 20 years he does not remember hearing of so large a mortality in February. It was also noted in Davis, Sacramento, Alturas, Dixon, Lockeford, Redding, Williams, Sausalito, Downey, Benicia, Red Bluff, Fresno, and Cedarville.

ERYSIPELAS.—Sporadic cases of this disease were noted in Modesto, Elk Grove, Anaheim, College City, Knights Ferry, Needles, Williams, Sausalito, Downey, Bakersfield, Salinas, Red Bluff, Fresno, and Newcastle.

TYPHOID FEVER is not prevalent in any portion of the State. San Francisco reports some, and sporadic cases were noted in National City, Etna Mills, Napa, El Monte, Redding, Vacaville, Bakersfield, Salinas, and Wheatland.

TYPHO-MALARIAL FEVER was reported in College City, National City, San Diego, Igo, Cottonwood, Bakersfield, Salinas, Wheatland, Fresno, Gonzales, Lodi, San Francisco, and Galt.

CEREBRAL FEVER.—Sporadic cases of this disease were noticed in North San Juan, Galt, Fresno, Grass Valley, San Diego, San Francisco, Watsonville, and Sacramento.

REMITTENT FEVER was present in Shasta, Lockeford, Knights Ferry, Lodi, Anderson, Truckee, Gridley, Red Bluff, Wheatland, and Oakland.

INFLUENZA, or LA GRIFFE, has, since the last report, developed into a widespread epidemic, equaling, if not exceeding, that which prevailed during the winter of 1889-90. That it spreads by atmospheric influence may be inferred from its rapid diffusion from place to place without any known intermediate intervention of contagion by external media. The present epidemic may be characterized by its sudden onset. The intensity of its initiatory symptoms, the premonitory chill, the fever, headache, backache, pains in the bones and muscles that more nearly resemble *dengue*, or backbone fever, than any other disease we can remember. Another feature peculiar to the present epidemic is the frequency with which cases occur in which the cough is almost entirely absent, and others in which pneumonia of a low type is almost certain to be developed. The debility accompanying the disease is invariably present, and must be treated by stimulants liberally given. The origin of the disease being unknown, the power of the sanitarian over it is exceedingly limited, and consists chiefly in advising the avoidance of all depressing influences that might deteriorate the healthy constitution or impair its strength.

PACIFIC COAST WEATHER SUMMARY.

The month of February has been distinguished by the following important features: (1) The southerly movement of three cyclonic areas which passed eastward through central Oregon, giving rise to the heavy rains, high winds, and high temperatures of the month in California and Nevada. (2) The violent cyclone of February 20th to 24th, which gave rise to remarkably high and destructive winds, heavy rains, and the lowest barometer readings for many years—Baker City, 28.94 inches; San Francisco, 29.10; Red Bluff, 29.02; Fresno, 29.32; Fort Canby, 29.06. (3) Seven cyclonic areas came within the limits of the Signal Service charts during the month, 4 of which passed eastward north of Washington. (4) The anti-cyclone of the 1st to 4th, which gave rise to a severe cold wave in Washington and Oregon, producing the lowest temperatures of the month—Baker City, Oregon, 12° below zero. This cold wave extended southward into Nevada and eastern California on the 4th—Halleck, Nevada, 14° below zero. (5) The anti-cyclone of 7th to 9th, which gave rise to the severe "norther" of the 8th in California; this anti-cyclone was attended by the lowest temperatures of the month in California and Nevada, and destructive winds in California, especially in the southern portion—Halleck, Nevada, 23° below zero on the 9th. Heavy sand storms and killing frosts, with the blowing down of some buildings, attended the "norther" in Southern California.

(6) The high southerly winds, high temperatures, and heavy rains of the 12th to 17th, 20th to 24th, and 26th to 28th, in Northern California and Nevada. (7) From the 9th to the last day of the month the presence of a cyclonic disturbance was manifest without cessation off Vancouver Island.

RAINFALL.—The rainfall has been in excess of the normal in all districts except western Washington and northwestern Oregon. The long spell of drought was broken on the 14th, and in the last half of the month enough rain has fallen to carry the amount decidedly beyond the normal in southern Oregon, California, and Arizona. If this large precipitation could have been distributed over the month, much less damage would have resulted to property and greater benefits derived from the greatly needed moisture. The excess varies from .19 of an inch at Winnemucca to 4.84 inches at Los Angeles, 6.83 at Red Bluff, and 6.78 at Roseburg. The deficiency ranges from .19 of an inch at Fort Canby to 3.55 inches at Olympia. The rainfall at San Francisco has been exceeded in 6 other years during the past 40 years; the largest amount, 12.52 inches, occurred in February, 1878, and the next largest amount, 9.24 inches, in 1887. The largest monthly rainfall was 11.50 inches at Roseburg. The greatest in 24 hours was 3.80 inches at Red Bluff on the 14th. Rain fell on 23 days in Washington, on 26 days in Oregon, on 25 days in California, on 22 days in Nevada, and on 10 days in Arizona.

LOCAL STORMS.—Thunder storms, Eureka, 17th, Gilroy, 24th, Vacaville, 25th. Buildings struck by lightning, Shasta County, 18th. Hail, Eureka, 17th, San Francisco, 24th, Astoria, 6th, 19th, Shasta County, 18th. Winds of over 30 miles per hour have occurred on 2 days at Eureka, 5 days at Fort Canby, 6 days at San Francisco, Red Bluff, and Sacramento, and 14 days at Winnemucca.

TEMPERATURE.—It has been almost stationary in all districts, with a slight excess of 1° to 2° in northern Nevada, western Arizona, and south-western California. The deficiency ranges from 4° at Keeler to 3° at Red Bluff and Olympia, and 1° at Eureka, Fort Canby, and Spokane Falls. The highest temperature, 74°, occurred at Yuma on the 7th and 14th. The lowest, 23° below zero, occurred at Halleck, Nevada, on the 9th, Baker City, 12° below, on the 2d.

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Abstract of the Reports of Deaths and their Causes in California during February, 1891.

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ABSTRACT FOR FEBRUARY, 1891—Continued.

LOCATIONS AND AUTHORITIES.	Estimated Popula- tion	Deaths																									
		Total Deaths	Consumption	Acute Pneumonia	Acute Bronchitis	Congestion of the Lungs	Diarrhoea and Dysentery	Cholera Infantum	Other Diseases of St'mach & Bow'ls	Diphtheria	Croup	Scarlet Fever	Measles	Smallpox	Whooping-Cough	Typho - Malarial Fever	Typhoid Fever	Remittent and Intermittent Fevers	Cerebro - Spinal Fevers	Cancer	Erysipelas	Heart Diseases	Alcoholism	Other Causes			
Los Angeles, Dr. G. MacGowan	65,000	80	20	17	0	3	0	0	5	20	0	0	0	0	0	0	0	0	0	1	0	6	0	26	1	3	2
Marysville, Dr. D. Powell	5,000	5	1	2	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	2	4
Modesto, Dr. W. J. Whitte	2,400	7	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1
Monterey, Dr. S. H. Smith	1,800	5	1	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1
Napa, Dr. M. B. Pond	5,000	10	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1
National City, Dr. J. W. Keene	1,200	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1
Newcastle, Dr. M. Schmale	400	66	7	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	29	1	1
Oakland, Dr. D. D. Crowley	60,000	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1
Oakdale, Dr. R. H. Endicott	1,000	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1
Oroville, Dr. J. H. M. Karsner	2,000	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1
Orland, Dr. W. Thurston	3,500	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1
Pasadena and vicinity, Dr. H. H. Sherk	8,000	13	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1
Petaluma and vicinity, Dr. L. H. Patty	8,000	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1
Pleasanton, Dr. W. H. Cope	800	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1
Red Bluff and vicinity, Dr. J. M. West	5,000	10	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1
Redding, Dr. F. P. Mitchell	3,000	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1
Redwood City, County Recorder	2,000	3	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1
Rocklin, Dr. A. M. Stafford	800	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1
Roseville, Dr. W. W. Finney	500	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1
Sacramento, Dr. H. L. Nichols	30,000	43	6	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
Salinas City, Dr. May Gydison	2,700	6	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1
San Diego, Dr. T. L. Magee	16,000	14	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1
San Francisco, Dr. J. W. Keeney	300,000	574	88	65	26	8	1	1	24	38	1	0	0	0	0	0	0	0	0	0	0	0	0	0	221	13	1
San José, Dr. J. R. Curnow	25,000	45	4	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1
Santa Ana and vicinity, Dr. J. G. Bailey	15,000	4	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1
Santa Barbara, Dr. R. F. Winchester	5,849	9	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1
Santa Maria, Dr. M. Thorneberg	1,000	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1
Santa Cruz, Dr. C. L. Anderson	7,000	22	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1
Santa Rosa, Dr. J. S. Sargent	5,500	12	4	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1
Santa Monica, Dr. E. C. Folsom	1,500	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1
Selma, Dr. E. E. Brown	1,800	3	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1
Stockton, Dr. C. A. Ruggles	14,400	25	2	3	4	1	0	0	1	5	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2
Suisun, Dr. J. W. B. Reynolds	1,000	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Truckee and vicinity, Dr. W. Curless	1,300	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
Tulare City, Dr. H. Antrim	3,000	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
Vacaville and Elmira, Dr. J. W. Stitt	4,500	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
Vallejo, Dr. W. D. Anderson	6,000	9	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	4
Watsonville, Dr. W. B. Rodgers	2,500	9	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3
Wheatland, Dr. L. Melton	900	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Woodland, Dr. T. Ross	4,000	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	709,199	1,150	167	160	44	18	3	1	56	61	26	0	4	0	4	2	7	1	7	33	2	100	9	445	0	0	0

MARCH, 1891.

Reports of mortality received from 86 localities in different parts of the State, with an estimated population of 681,497, give the number of decedents as 1,251, being a monthly percentage of 1.83 per 1,000, or an annual mortality of 21.96, which is the largest death rate in any single month that has been recorded for years. This increase in the monthly percentage may be more apparent than real, owing to the correction of the estimated population in those towns and cities reported by the Census Bureau this month. When the population of all the towns is officially declared we will be able to get closer to the actual death rate in California than we are at present.

CONSUMPTION caused 188 deaths, which is above the average mortality from this cause. PNEUMONIA was fatal in 168 instances, which is above the mortality in January or February, and the largest number yet reported in any single month.

BRONCHITIS caused 38 deaths, which is a slight decrease from the mortality in February. CONGESTION OF THE LUNGS was credited with 21 deaths.

WHOOPING-COUGH, although quite prevalent, caused but 4 deaths.

DIPHTHERIA is reported to have caused 68 deaths. Of these 49 occurred in San Francisco, 2 each in Chico, Folsom, Modesto, Napa, Oakland, and Orland, and 1 each in Alameda, Berkeley, El Monte, Los Angeles, Pasadena, Pomona, and Visalia.

CROUP had a fatality of 20. Fourteen were reported from San Francisco, and 1 each from Azusa, Newcastle, Pasadena, Watsonville, San José, and Sacramento.

CHOLERA INFANTUM caused 3 deaths, which is conclusive evidence that the disease is not prevalent.

DIARRHŒA AND DYSENTERY were reported as causing 15 deaths, which is quite an increase over the preceding month, when 3 deaths only were recorded from these causes.

SCARLET FEVER, although quite prevalent in many places, is only credited with 3 deaths, which is reliable evidence of the mild character of the disease.

MEASLES is also reported as causing only 3 deaths, from which a like inference as to the type of the disease may be drawn.

TYPHO-MALARIAL FEVER caused no deaths.

TYPHOID FEVER was fatal in 15 instances, a slight increase over the mortality from it last month.

REMITTENT FEVER is credited with 4 deaths.

CEREBRAL FEVER.—Nine deaths were attributed to this disease.

ERYSIPELAS was fatal in 7 instances.

CANCER caused 33 deaths.

HEART DISEASE was fatal in 95 cases.

ALCOHOLISM caused 21 deaths.

DEATHS FROM CAUSES not classified in this abstract, 431.

PREVAILING DISEASES.

Reports of sickness received from 98 localities in different parts of the State show a tendency to abatement in all hitherto prevailing diseases. The lessened rainfall and the increased temperature during the month had a salutary influence in diminishing the prevalence of pulmonary diseases, although the frequency and fatality of pneumonia was exceptionally great for March. We find an increasing number of reports of diseases of the alimentary canal, although cholera infantum does not figure among them. Dysentery was quite noticeable in many localities, but of a mild type.

CHOLERA INFANTUM, where mentioned, was only reported in sporadic form.

DIARRHŒA AND DYSENTERY were reported of frequent occurrence in Bakersfield, Elsinore, Fresno, Needles, Santa Paula, Hopland, Merced, Santa Rosa, College City, Sacramento, Visalia, Igo, Oakdale, Etna Mills, El Monte, Jackson, Los Angeles, Modesto, Marysville, San José, Eureka, and San Francisco.

VARICELLA, OR CHICKENPOX, reported in Sacramento and Mariposa.

MEASLES was reported as present in Sacramento, Redding, Vacaville, Lodi, Dixon, College City, Williams, Lockeford, Anaheim, Merced, Fresno, Sausalito, Alameda, Oakland, and San Francisco.

SCARLET FEVER in a mild form was observed in many places, among the number being Sacramento, Alturas, Stockton, Santa Cruz, Dixon, and San Francisco.

DIPHTHERIA and CROUP still continue to be the scourge of young life, and claim as victims many of the healthiest children as well as the weakest. The direct cause remains still a mystery. After the most careful research, made by the local Government Board, in England, Dr. Buchanan, the Chief Medical Officer, says: "This disease has appeared to prevail under every variety of associated conditions. As usual, it has been accompanied, or its outbreak has been preceded by, abundant cases of apparently innocent sore throat. Neither has the approximate cause of diphtheria become any more apparent from the various bacteriological investigations that have been made," although all observers agree that the disease is owing to a bacillus, the identity of which is yet undiscovered. It is also agreed that its growth is favored in the presence of dampness and the absence of light, and that dryness, sunlight, and cleanliness are inimical to it. The view is also gaining ground that the disease is local before becoming general. If this conception is established it magnifies the importance of using disinfectant gargles and washes, and the absolute necessity of isolation, with strict cleanliness, accurate disinfection, with early and skilled treatment, if we would hope to limit or prevent the disease. Professor Löffler declares it as his opinion that the disease affecting pigeons, calves, pigs, turkeys, etc.,

which resembles diphtheria, is not caused by the bacillus of human diphtheria, and that those diseases in the lower animals are therefore not to be feared as sources of the human affection. Klein, however, believes that etiologically they are the same, and should be looked upon as transmissible to man, and therefore it would be prudent to keep such animals away from the dwelling place during the prevalence of any such sickness.

WHOOPING-COUGH prevailed quite extensively in Sacramento, San Francisco, Oakland, Salinas, Downieville, Etna Mills, Middletown, and Alameda.

ERYSIPELAS was reported in sporadic form in Sacramento, Anderson, Brownsville, Bakersfield, Benicia, Santa Cruz, Downey, Mariposa, Merced, Etna Mills, Pleasanton, Fresno, Eureka, Modesto, Anaheim, and San Francisco.

TYPHOID FEVER.—A very few cases of this disease were reported as observed in Bakersfield, Merced, Etna Mills, Newcastle, San José, Sacramento, Los Angeles, and San Francisco.

TYPHO-MALARIAL FEVER was reported in Redding, Igo, Cottonwood, Merced, and Mariposa.

REMITTENT FEVER was observed in Redding, Needles, Lockeford, Knights Ferry, Fresno, and Visalia.

CEREBRAL FEVER.—Some isolated cases were reported in Sacramento, College City, Redding, Alameda, Gridley, Pomona, Watsonville, and San Diego.

PNEUMONIA was reported in every notice received, which exhibits its great prevalence. Following so large a proportion of cases of la grippe, it tends to show that there is some sort of connection between the two. Although the microphyte of pneumonia has apparently been identified, it is not yet placed beyond doubt, as if it were we must necessarily be obliged to place pneumonia among the communicable diseases. Several facts, however, contribute to this view, and even well-marked cases were noticed that seemed to be derived from others in close proximity.

BRONCHITIS prevailed extensively the past month throughout the State.

INFLUENZA, OR LA GRIPPE, continued in an epidemic form during the month. It is now on the wane, and probably by the next report issued it will have disappeared from the State. One of the most noticeable features of the epidemic was the predominance of the nervous symptoms. These were manifested by the violent headache, the pain down the spine, with oftentimes sensitiveness of the skin, making it painful to the touch, the mental depression, the tendency to faintness, which often preceded the attack, with the utter prostration following it, indicated the profound impression the poison exerted on the nerve centers.

THE STATE BOARD OF HEALTH.

The present Board having been superseded in office, with this issue of the "Monthly Circular" the connection of the present Secretary with it ceases. Hereafter his successor in office, when elected, will, it is to be hoped, improve and continue it for the information of the public and the instruction of those who are interested (as all should be) in the sanitary welfare of the State. Under the auspices of the deposed Board, sanitation in California was making a well-marked advance, and inducing a public interest in the matter which will yet bear fruit abundantly if it is sedulously cultivated. The Board has now had local Boards of Health organized and Health Officers appointed throughout the State; has enlisted a corps of sanitary correspondents who most diligently, and without monetary consideration, have kept the Secretary advised every month of the health of their different localities, and of the prevailing diseases existing, so that at any time the Secretary was in a position to take immediate action in the suppression of a threatened epidemic or the prevention of the advance of pestilential disease. The Board has also been successful in having Congress establish quarantine stations to protect our coast from imported disease. The one in San Francisco harbor, when completed, will be the most perfect in America, and will only be equaled by the one now in progress of erection in San Diego.

In taking leave of the public, the Board is desirous of acknowledging its obligation to the medical profession, the public press, and the railroads for the many favors extended to it, and would bespeak for its successors like courtesies from its many correspondents, upon whose kindness so much depends. Public health or sanitary efforts are not subjects to be controlled by or mixed with political prejudices or party strife. Sanitary science, being governed by natural law and not by politics, experience teaches us that neither disease nor death will be controlled by party dictation, or even arrested by party faith without sanitary works. Contagious diseases do not consult the political proclivities of their victims before invading the sanctity of their dwellings.

REPORT OF THE STATE BOARD OF HEALTH.

Abstract of the Reports of Deaths and their Causes in California during March, 1891.

LOCATIONS AND AUTHORITIES.	Other Causes	Alcoholism.....	Heart Diseases	Erysipelas.....	Cancer	Cerebro - Spinal Fevers.....	Remittent and Intermittent Fevers	Typhoid Fever	Typho - Malarial Fever.....	Whooping-Cough..	Smallpox	Measles.....	Scarlet Fever	Croup.....	Diphtheria	Other Diseases of St'mach & Bow'ls	Cholera Infantum.	Diarrhoea and Dysentery	Congestion of the Lungs	Acute Bronchitis..	Acute Pneumonia..	Consumption	Total Deaths	Estimated Population
Alturas, Dr. J. M. Forrest.	2,250																						2	2,250
*Alameda, Dr. John T. McLean	11,165																						13	11,165
Anderson, Dr. O. P. Paulding	1,000																						3	1,000
Auburn, A. S. Waldo, H. O.	2,000																						1	2,000
Asusa and vicinity, Dr. J. H. Miller	2,000																						5	2,000
Bakersfield, Dr. C. A. Rogers	3,200																						7	3,200
*Benicia, Dr. E. Gray	2,360																						3	2,360
Berkeley, Dr. F. H. Payne	4,000																						7	4,000
Brownsville, Dr. L. C. Crossman	800																						3	800
College City, Dr. H. Gibbons	700																						2	700
Cloverdale, Dr. R. S. Markell	1,500																						3	1,500
*Chico, Dr. W. King	2,894																						16	2,894
Dixon, Dr. A. Traflet	2,500																						2	2,500
Downville, Dr. A. Jump	1,000																						1	1,000
Downey and vicinity, Dr. Q. J. Rowley	2,500																						1	2,500
Etna Mills, Dr. E. W. Bathurst	500																						3	500
*Eureka, Dr. S. B. Foster	4,858																						9	4,858
Elsinore, Dr. T. E. Ellis	1,200																						1	1,200
El Monte, Dr. F. P. Cave	800																						1	800
Forest Hill and vicinity, Dr. Paul Reudy	5,000																						4	5,000
Fresno City, Dr. T. M. Hayden	10,818																						8	10,818
Folsom, Dr. E. F. Bates	1,500																						2	1,500
Grass Valley, Dr. W. C. Jones	6,000																						5	6,000
Gridley, Dr. J. T. Harris	2,500																						2	2,500
Haywards, Dr. G. E. Alexander	1,200																						6	1,200
Hopland, Dr. C. F. Grant	600																						1	600
Hollister, Dr. J. H. Tebbetts	1,500																						3	1,500
Igo, Dr. H. Schafer	600																						2	600
Jackson, Dr. E. B. Robertson	2,600																						5	2,600
Knights Ferry and vic, Dr. J. H. Lowe	1,250																						1	1,250
Lockeford, Dr. E. N. Foote	500																						1	500
*Long Beach, Dr. J. W. Wood	2,000																						1	2,000
Lodi, Dr. A. E. Burchard	2,000																						6	2,000

[illegible]

NOTE.—Population of towns marked with an asterisk are from official census, 1890. †Including towns reporting no deaths, of an aggregate population of 9,100.

APRIL, 1891.

RECOMMENDATIONS OF THE STATE BOARD OF HEALTH.

The State Board of Health, on the 10th of April, instructed the Secretary to announce to local Boards and correspondents generally that vague terms, such as heart failure, dropsy, colds, and childbirth, given in some monthly reports as causes of death, will be regarded as neither sufficient nor satisfactory; and to recommend that specific terms, having the sanction of usage, and recognized in medical nomenclature, be invariably used to designate the cause of death. The wisdom of such recommendation is obvious to intelligent minds. The objects to be attained are precision and accuracy.

The Secretary was also instructed to obtain the census of 1890 for all the cities and towns of importance in California, and to compute percentages of deaths from such corrected estimates of population. This number shows this to have been only partially done, but the next will show a full compliance with these instructions.

To Correspondents.—It is hoped that correspondents who have hitherto furnished reports to the State Board of Health will continue to do so.

It is not desirable to make changes unless the cause is imperative. Should, however, some be unable to continue this work, which is essentially in the cause of humanity, it would be well to send a notification to that effect, so that others may be secured. Such notification will admit of no delay. If, therefore, localities that have heretofore sent regular reports, fail to send either a report for May, or a notification of inability to continue, it will be taken as an intimation that the Board will be at liberty to invite another correspondent.

It is extremely desirable that all reports should be forwarded at the earliest possible date after the end of each month. It is unnecessary to add that the members of the Board, and especially the Secretary, will appreciate fully the efforts of those who give their time and services to this cause. He desires their good will and support in the interest of sanitation in California.

REMARKS.

Mortality reports from 67 cities, towns, and localities, having a population of 674,830, show 1,064 deaths to have occurred from all causes. This is a percentage of 1.57 per 1,000 per month, or 18.84 per 1,000 per annum.

Consumption was the cause in 164 cases, pneumonia in 153, bronchitis in 40, and congestion of the lungs in 8. Diarrhoea and dysentery are assigned as the cause of 7 deaths, cholera infantum 3, and of other diseases of the stomach and bowels 51. Croup caused 21 deaths, scarlatina but 1, whooping-cough 3, typhoid fever 14, malarial fevers 3, cerebrospinal fevers 6, cancer 29, erysipelas 1, heart disease 63, alcoholism 13, and all other causes, not necessarily classified, 436. Of this last number la grippe is responsible for 13 deaths, and there is a reasonable presumption that many fatal cases of lung disease are traceable directly to an attack of that disease. Diphtheria caused death in 48 cases, San Francisco furnishing 27. This disease is undoubtedly communicated by germ contagion or infection, but the principal influences contributing to its virulence and fatality are those unsanitary conditions arising from soil pollution, bad drainage, with resulting vitiated air and impure water. It follows, then, that efforts to reduce the numerical quantity and lessen the fatality of this disease should consist in the construction of good sewers and good drains, the removal of all offensive matter, the obliteration of stagnant water, and the annihilation of filth. Diarrhoea is given as the cause of 9 deaths. Localities having a large number of cases of la grippe show also an increase in diarrhoea; the city of Fresno, for example, reporting 33 cases of la grippe and 18 of diarrhoea. The general catarrhal condition of all the mucous surfaces in the former diseases is a sufficient explanation of the accompanying diarrhoea.

PREVAILING DISEASES.

MEASLES was reported from Middletown, Anderson, Downieville, Dixon, Etna Mills, San Pedro, Santa Paula, Truckee, Anaheim, College City, Red Bluff, Fresno, and Sacramento.

WHOOPING-COUGH has been in Sacramento, Fresno, Vacaville, Downieville, and Oakdale. LA GRIPPE.—The only disease that may be said to prevail extensively is la grippe, 363 cases being reported from different parts of the State, with an accredited fatality of 13. Fresno reported 33 cases, with 31 of bronchitis and 5 of pneumonia. Red Bluff 50, with 5 of bronchitis and 10 of pneumonia. Lincoln 10, with 1 of bronchitis. College City, 16, with 7 of bronchitis and 4 of pneumonia. Pleasanton 20, with 20 of bronchitis and 2 of pneumonia. Elsinore reported 15 cases, Alturas 13, Vacaville 10, with 8 of bronchitis and one of pneumonia. Eureka 5, with 10 of bronchitis and 2 of pneumonia. Anderson had 40 cases, Middletown 11, Oakdale 4, Calico 10, Knights Ferry 8, Gridley 10, Needles 20, National City 6, Etna Mills 15, Santa Paula 3, Benicia 6, and Truckee 60 cases. San Francisco, Los Angeles, San Diego, and other southern points of importance report none at all. Oakland, Alameda, and San José are almost, if not altogether, exempt. The progress of this remarkable malady has been somewhat erratic, following no well-defined course, and requiring no unusual local conditions for its development. It is unnecessary to predict its future in California. If the prevalence of moisture in some portions of the State during April is responsible for the extension of its visit, it would seem to follow that San Francisco, which had heavier rainfalls than for years before in April, should have had la grippe. Such, however, was not the case, none being

reported. The southern portion of the State has not been entirely exempt. Needles and Calico are in a region rated by the Signal Office as below normal in rainfall for April, but yet they have suffered severely from la grippe. In these instances moisture cannot have been the cause.

An abstract from the Signal Service report by Lieut. John P. Finley, U. S. A., for April, is appended, to give those who may be interested in following this subject an opportunity to estimate the value of rainfall and temperature in favoring or limiting the prevalence of this unique visitation:

The rainfall has been in excess of the normal in Northern California, western Oregon, and western Washington. Elsewhere there has been a deficiency. The excess varies from .05 of an inch at Sacramento to 3.31 inches at Eureka. The deficiency ranges from .04 of an inch at Los Angeles to 1.14 inches at Fresno. The heaviest monthly rainfall was 7.80 inches at Fort Canby, and the smallest .10 of an inch at Keeler. No rain fell at Yuma and Fort Grant, which fact marks an unusual deficiency for Arizona. The rainfall at San Francisco was 2.44 inches, or .40 of an inch above the normal. This is one of the heaviest rainfalls at San Francisco for a number of years during April. The other dates of heavy rainfall are as follows: 1853, 5.37; 1855, 5.00; 1860, 3.14; 1880, 10.06; 1884, 6.33; 1886, 5.28.

TEMPERATURE.—The temperature has been in excess of the normal in all districts, except the central portion of California, where the deficiency ranges from 3° at Keeler to 4° at Sacramento. It remained normal at San Francisco and Eureka. The excess ranges from 8° at Roseburg, and 6° at Yuma, to 1° at San Diego, Fort Canby, and Olympia. The highest temperature, 102°, occurred at Yuma on the 28th, and 100° on the 27th. The lowest temperature, 20°, occurred at Baker City, Oregon, on the 2d. Light frosts occurred in Northern California on the 8th, 11th, and 26th; in Oregon on the 2d, 3d, and 8th; in Nevada on the 11th, 19th, and 26th.

STATIONS.	RAINFALL.			TEMPERATURE.	
	April Rainfall.	Total Seasonal.	Normal April.	Average Monthly.	Normal April.
Red Bluff.....	2.30	20.51	2.18	58	56
Sacramento.....	2.00	15.00	1.95	52	56
San Francisco.....	2.44	16.22	2.04	53	53
Fresno.....	0.50	8.22	1.64	59	62
Keeler.....	0.10	4.36	0.64	57	60
Los Angeles.....	1.30	13.08	1.34	59	54
San Diego.....	0.80	10.02	0.90	58	57
Yuma.....	0.00	6.22	0.11	70	64
Fort Grant.....	0.00	17.36	0.60	59	-----

Abstract of the Reports of Deaths and their Causes in California during April, 1891.

LOCATIONS AND AUTHORITIES.	Other Causes	Alcoholism.....	Heart Diseases	Erysipelas.....	Cancer	Cerebro - Spinal Fevers.....	Remittent and Intermittent Fevers.....	Typhoid Fever	Typho - Malarial Fever.....	Whooping-Cough..	Smallpox	Measles.....	Scarlet Fever	Croup	Diphtheria.....	Other Diseases of St'mach & Bow'ls	Cholera Infantum.....	Diarrhoea and Dysentery.....	Congestion of the Lungs.....	Acute Bronchitis..	Acute Pneumonia..	Consumption	Total Deaths	Estimated Population
Alturas, Dr. J. M. Forrest.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	2,250
Alameda, Dr. John T. McLean.....	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	8	11,250
Anaheim, Dr. J. H. Bullard.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	2,000
Anderson, Dr. O. P. Paulding.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,000
Berkeley, Dr. E. Gray.....	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	7	2,800
Berkeley, Dr. F. H. Payne.....	11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	11	3,500
Calico, Dr. A. R. Rhea.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	600
Colton, Dr. M. F. Price.....	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	2,000
College City, Dr. C. H. Gibbons.....	700	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	2,500
Colusa, Dr. W. Thurston.....	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1,250
Cottonwood, Dr. J. O. Smith.....	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	12	10,000
Chico and vicinity, Dr. William King.....	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	2,000
Dixon, Dr. A. Trafton.....	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	2,500
Downey and vicinity, Dr. Q. J. Rowley.....	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	1,000
Etna Mills, Dr. E. W. Bathurst.....	1,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	800
El Monte, Dr. T. P. Cave.....	3,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	3,000
Eureka and vicinity, Dr. S. B. Foster.....	1,200	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,200
Elsinore, Dr. T. E. Ellis.....	3,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	3,000
Forest Hill and vicinity, Dr. Paul Reudy.....	10,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	10,000
Fresno, Dr. T. M. Hayden.....	1,500	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1,500
Folsom, Dr. B. F. Bates.....	6,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1	6,000
Grass Valley, Dr. W. C. Jones.....	1,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	1,000
Gridley, Dr. J. T. Harris.....	1,200	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	1,200
Haywards, Dr. G. E. Alexander.....	4,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	4,000
Healdsburg and vic., Dr. N. B. Coffman.....	1,200	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	1,200
Hollister, Dr. J. H. Tebbetts.....	2,600	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	1	2,600
Jackson and vic., Dr. E. B. Robertson.....	1,250	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1,250
Kings Ferry and vic., Dr. J. H. Lowe.....	500	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	500
Lincoln, Dr. Joseph Flint.....	2,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	2,000
Long Beach and vic., Dr. J. W. Wood.....	55,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	19	8	55,000
Los Angeles, Dr. G. MacGowan.....	4,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	4,000
Marysville, Dr. D. Powell.....	1,500	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	1,500
Mendocino and vic., Dr. J. W. Milliken.....																								

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MAY, 1891.

Reports from 66 cities, towns, and villages, having an aggregate population of 608,945, show a mortality of 945 from all causes. This is a percentage of 1.55 per 1,000 for May, or 18.60 per 1,000 per annum.

Consumption was fatal in 140 cases, being a reduction of 24 since April. Pneumonia was the cause of death in 91, bronchitis in 21, and congestion of the lungs in 11. There were 15 deaths from diarrhoea and dysentery, 8 from cholera infantum, and 34 from other diseases of the stomach and bowels. Diphtheria caused 33 deaths, croup 13, scarlatina 2, measles 3, and whooping-cough 8. Typho-malarial fever is credited with 3 deaths, typhoid fever with 20, remittent and intermittent fevers 7, and cerebro-spinal fever 3. Cancer caused 24, erysipelas 3, heart diseases 58, alcoholism 8, and all other causes 420.

PREVAILING DISEASES.

CHOLERA INFANTUM was reported at Fresno, San Pedro, Ione, Santa Paula, and Cottonwood.

DIARRHOEA has been quite prevalent, Willows reporting 12 cases, Modesto 111. It prevailed also at Ione, Etna Mills, Oakdale, Eureka, Lincoln, Bakersfield, Pleasanton, Santa Paula with 11, Vacaville, Middletown, San Pedro, Mariposa, College City, Red Bluff, and Fresno with 75 cases.

CHOLERA MORBUS was reported from Fresno, Modesto, Red Bluff, College City, Benicia, San Pedro, Pleasanton, Galt, Wheatland, and Williams.

DYSENTERY was reported from Williams, Ione, Downey, Gridley, Vacaville, San Pedro, Red Bluff, Modesto, and Fresno with 42 cases.

SMALLPOX has not been reported, but there is one case in the Sacramento City and County Pesthouse. It is believed to have been contracted at El Paso, Texas. Sufficient time has not elapsed to determine if the contagion is to spread. There are also cases of this disease at the United States Quarantine Station, near San Francisco, all of which are recovering.

MEASLES appears to be epidemic in Ione, 100 cases being reported. There were 10 at Red Bluff, 42 at Fresno, 11 at Wheatland, 20 at Oakdale, 16 at Bakersfield. It was also reported from Santa Paula, Truckee, Dixon, Vacaville, Mariposa, Lincoln, Etna Mills, Galt, and Sacramento.

SCARLATINA was reported from Ventura, Vacaville, Napa, Bakersfield, Oakdale, Ione, Modesto, and Sacramento.

DIPHTHERIA was reported from Modesto, St. Helena, Dixon, Truckee, College City, Eureka, and Napa.

FEVERS OF A MALARIAL TYPE have prevailed in Mariposa, Lincoln, Vacaville, Cottonwood, Sausalito, Pleasanton, Truckee, Gridley, San Pedro, Bakersfield, Ione, Red Bluff, Fresno, Wheatland, Oakdale, Etna Mills, Galt, and Williams.

TYPHOID FEVER has not prevailed to any great degree throughout the State. It is confined principally to the larger towns and cities.

DISEASES OF THE RESPIRATORY ORGANS coming under the head of pneumonia, bronchitis, and congestion of the lungs, have abated somewhat; but 133 deaths from these causes, exclusive of consumption, show that they prevail.

Three hundred and five cases of la grippe have been reported from 27 localities quite widely distributed.

San Francisco, Oakland, Los Angeles, San José, San Diego, Alameda, and Sacramento do not report prevailing diseases, the above reports being furnished from other sources.

The population is given according to the latest Census Report as published by Bancroft & Co., of San Francisco. It makes, in many instances, a material difference from former figures, but the discrepancy is explained when it is understood that many reports are taken from a wide area of territory covering many miles and attributed to one small town and vicinity. If, however, it is shown that any injustice is being done, a correction will at once be made.

Abstract of the Reports of Deaths and their Causes in California during May, 1891.

Other Causes	1	4	4	0	5	3	1	0	7	1	1	0	2	1	7	0	2	0	1	0	3	7	1	3	2	1	0	1	1	0	2	3	0	
Alcoholism.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	
Heart Diseases	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Erysipelas.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Cancer	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Cerebro - Spinal Fevers	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Remittent and Intermittent Fevers	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Typhoid Fever	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Typho - Malarial Fever	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Whooping-Cough.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Smallpox	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Measles.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Scarlet Fever	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Croup.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Diphtheria	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Other Diseases of St'mach & Bow'ls	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Cholera Infantum.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Diarrhoea and Dysentery	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Congestion of the Lungs	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Acute Bronchitis.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Acute Pneumonia.....	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Consumption.....	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Total Deaths	1	8	4	3	5	5	5	5	2	13	2	3	1	3	5	5	19	2	3	3	4	1	1	6	9	9	5	3	6	3	2	1	1	1
Estimated Population	512	11,900	1,200	3,000	1,601	2,000	2,591	2,040	10,000	1,867	2,500	400	10,000	3,000	10,796	1,960	700	4,032	350	700	1,625	4,000	2,800	400	53,894	2,009	2,397	425	350	1,200	4,387	50,000	2,000	
LOCATIONS AND AUTHORITIES.	Alturas, Dr. J. M. Forrest.	Alameda, Dr. John T. McLean.	Anaheim, Dr. J. H. Bullard.	Antioch and vicinity, Dr. W. S. George.	Auburn, Dr. A. S. Waldo.	Bakersfield, Dr. C. A. Rogers.	Benicia, Dr. E. Gray.	Colton, Dr. M. F. Price.	Chico and vicinity, Dr. William King.	Dixon, Dr. A. Traiton.	Downey and vicinity, Dr. Q. J. Rowley.	Etna Mills, Dr. E. W. Bathurst.	Eureka and vicinity, Dr. S. B. Foster.	Forest Hill and vic., Dr. Paul Reudy.	Fresno, Dr. W. T. Maupin.	Folsom, Dr. B. F. Bates.	Galt, Dr. Alex. Montague.	Grass Valley, Dr. W. C. Jones.	Gonzales, Dr. C. A. E. Hertel.	Gridley, Dr. J. T. Harris.	Haywards, Dr. G. E. Alexander.	Healdsburg and vic., Dr. W. B. Coffman.	Ione and vicinity, Dr. A. L. Adams.	Lockeford, Dr. E. N. Foote.	Los Angeles, Dr. G. MacGowan.	Merced, Dr. E. S. O'Brien.	Modesto, Dr. W. J. Wilhite.	Mariposa, Dr. J. W. Kearney.	Middletown, Dr. R. E. Hartley.	Monterey, Dr. Sidney H. Smith.	Napa, Dr. M. B. Pond.	Oakland, Dr. Paul J. Shafer.	Oroville, Dr. J. H. M. Karsner.	

ABSTRACT FOR MAY, 1891—Continued.

LOCATIONS AND AUTHORITIES.	Other Causes																								420
	1	2	3	6	1	2	0	10	231	14	3	1	2	0	3	2	3	2	0	1	1	4	6	1	0
Pasadena and vic., Dr. Henry H. Sherk.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8
Petaluma and vicinity, Dr. L. H. Patty.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8
Pleasanton, Dr. W. H. Cope	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8
Red Bluff and vicinity, Dr. J. M. West.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8
Redding, Dr. F. P. Mitchell	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8
Rio Vista, Dr. S. C. Brown	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8
Selma and vicinity, Dr. E. E. Brown	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8
San Diego, Dr. Thos. L. Magee	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8
San Francisco, Dr. J. W. Keeney	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8
San José, Dr. J. R. Curnow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8
San Luis Obispo, County Recorder	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8
Santa Paula and vic., Dr. D. W. Mott	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8
San Pedro, Dr. R. W. Hill	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8
Santa Monica, Dr. E. E. Folsom	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8
Santa Barbara, Dr. R. F. Winchester	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8
Santa Cruz, Dr. C. L. Anderson	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8
Santa Rosa, Dr. J. S. Sargent	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8
Suisun and vic., Dr. J. W. B. Reynolds	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8
St. Helena and vic., Dr. W. J. G. Dawson	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8
Truckee and vicinity, Dr. W. Curless	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8
Upper Lake, Dr. R. G. Reynolds	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8
Vallejo, Dr. W. D. Anderson	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8
Ventura and vic., Dr. N. J. Comstock	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8
Watsonville, Dr. W. D. Rodgers	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8
Wheatland and vicinity, Dr. S. Melton	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8
Williams, Dr. A. W. Kimball	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8
Totals	5	5	3	8	2	2	4	20	79	54	19	0	0	0	0	0	0	0	0	0	0	0	0	0	945
Estimated Popula- tion	7,000	8,000	842	5,000	1,861	1,900	2,000	16,150	297,990	18,027	3,004	3,000	1,000	1,700	5,864	5,694	5,216	2,000	2,800	1,300	1,300	5,904	7,000	2,153	608,945*

* Including the following towns reporting no deaths: Cottonwood, Cloverdale, Downsville, Elsinore, Long Beach, Santa Maria, Vacaville, and Elmira.

JUNE, 1891.

Mortality reports from 75 cities, towns, and localities, aggregating a population of 675,954, show a total of 995 deaths from all causes. This is a percentage of 1.47 per 1,000 for June, or 17.64 per 1,000 per annum.

There were 140 deaths from consumption, 59 from pneumonia, 29 from bronchitis, 13 from congestion of the lungs, 18 from diarrhoea and dysentery, 24 from cholera infantum, 54 from other diseases of the stomach and bowels, 47 from diphtheria, 7 from croup, 7 from scarlatina, 2 from measles, 11 from whooping-cough, 1 from malarial fever, 23 from typhoid fever, 6 from cerebro-spinal fever, 32 from cancer, 1 from erysipelas, 78 from heart disease, 15 from alcoholism, and 428 from all other causes.

But few deaths have been reported as due to excessive heat, yet a sufficient number of cases of sunstroke have been noted during the few days of the heated term to dispel forever, it is hoped, the traditional fiction that insolation never occurs in California.

A reference to the mortality table will demonstrate an increase of deaths at San Francisco from diphtheria, there being 25 reported, as against 18 in May. It is remarkable that so much indifference should be shown to the ravages of a disease that is as surely preventable as smallpox. Every one will concede that 25 deaths from either cholera or smallpox would produce the utmost consternation in San Francisco. Nevertheless, 25 deaths from diphtheria, confined to those of tender years, seems to produce but little effect on those who have the control of ways and means with which to construct drains and sewers suitable to the urgent needs of a rich and populous city. Perhaps if these fatalities were confined to the voting class, a political thrill might find its tortuous way up the metropolitan spinal marrow, and for a time lead to the consideration of public morals in the way of municipal cleanliness. The same will apply to any other town or city.

PREVAILING DISEASES.

Reports of prevailing diseases from 47 localities show diseases of the stomach and bowels of a diarrhoeal character to have been quite common. There were 218 of simple diarrhoea, 27 of cholera infantum, 90 of cholera morbus, and 40 of dysentery. The fatalities have been light, considering the high temperature of the month. Thirty-three cases of measles, 33 of diphtheria, 3 of croup, 20 of erysipelas, 26 of typhoid fever, 275 of malarial fevers, 20 of pneumonia, 103 of bronchitis, 109 of la grippe, and 109 of whooping-cough, comprise the remainder. This would indicate that fevers of a malarial type were more prevalent than any other class of disease. This is easily explained by the late rains, creating surface water, followed by great heat. La grippe is diminishing, yet a considerable number of cases of bronchitis are attributable to this cause. The State, sanitarily considered, is in a healthy condition, and due vigilance should be observed in order to keep it so during the two months of warm weather before us.

JULY, 1891.

Mortality reports from 66 cities, towns, and villages, aggregating a population of 695,866, show 1,096 deaths from all causes. This is a percentage of 1.57 per 1,000 for July, or 18.84 per annum.

There were 141 due to consumption, 45 to pneumonia, 12 to bronchitis, 5 to congestion of the lungs, 16 to diarrhoea and dysentery, 62 to cholera infantum, 89 to other diseases of the stomach and bowels, 34 to diphtheria, 10 to croup, 5 to scarlatina, 7 to measles, 5 to whooping-cough, 5 to typho-malarial fevers, 38 to typhoid fever, 2 to remittent and intermittent fevers, 10 to cerebro-spinal fever, 45 to cancer, 80 to heart disease, 12 to alcoholism, and 473 to other causes.

There were 45 deaths from pneumonia as against 59 in June; 12 from bronchitis as against 29 in June; and 5 from congestion of the lungs as against 13 in June. This shows a marked decrease in acute diseases of the respiratory organs.

There were 38 deaths from typhoid fever, and 5 from typho-malarial fevers, as against 23 in June.

There were reported only 34 deaths from diphtheria as against 47 in June.

PREVAILING DISEASES.

Reports of diseases prevailing in 45 localities outside of cities and large towns show 39 cases of cholera infantum, 148 of diarrhoea, 42 of cholera morbus, 43 of dysentery, 43 of measles, 16 of scarlatina, 19 of diphtheria, 80 of whooping-cough, 25 of erysipelas, 26 of typhoid fever, 321 of malarial fevers, 5 of cerebral fevers, 3 of pneumonia, 45 of bronchitis, 7 of congestion of the lungs, 25 of influenza, and 7 of acute rheumatism.

Measles prevailed extensively at Middletown, Bakersfield, and Mariposa.

Red Bluff reported 25 cases of whooping-cough, and College City 18 cases.

Chico reported 14 cases of diphtheria.

Scarlatina has been reported from a number of places, always as in a mild form.

YELLOW FEVER.

The San Francisco "Chronicle" a few days ago published the following:

"Yellow Fever at Guaymas.—A letter received in this city by a business house, dated at Nogales, July 30th, states that the yellow fever prevails at Guaymas. There were 7 or 8 deaths a day during the week which preceded the writing of the letter. The informant adds that great efforts are being made to conceal the presence of the disease from the outside world, and that fines are threatened against any one in Guaymas who shall give information regarding the state of affairs."

A reply to a telegram to the "Chronicle" said: "Information authentic; it came in a letter to a merchant here, but we are not at liberty to give his name."

A telegram wired to Guaymas brought the following reply, dated August 7th: "No yellow fever at Guaymas or on the west coast of Mexico. A. Willard, U. S. Consul at Guaymas."

It is not improbable that the "Chronicle's" informant mistook dengue or some low form of malarial fever for yellow fever. It is scarcely probable that Consul Willard is mistaken; neither is it likely that the authorities influenced the telegraph companies to distort his message. Until further report is had to the contrary, it must be held that yellow fever does not prevail in Guaymas, and that we are not at this time in danger of invasion from that direction.

I believe it is generally admitted that a mean temperature above 70° F., with an abundance of moisture in the atmosphere, is necessary for the propagation of yellow fever.

There is some doubt about the hot valleys of the State possessing these conditions. It would not be wise, however, to permit the experiment, and the utmost vigilance will be observed during the remainder of the summer.

The health of the State is, generally speaking, very good; no epidemic prevails.

A preventive disease circular, entitled "Diphtheria; Its Restriction and Prevention," has been published by authority of the State Board of Health, and is intended for general distribution among the people. It will be sent, in numbers required, upon application to the Secretary of the Board at Sacramento.

Abstract of the Reports of Deaths and their Causes in California during July, 1891.

Other Causes	7	5	1	3	2	2	4	0	0	2	3	3	1	0	2	2	9	1	0	9	0	2	1	0	1	2	27	0	1	3	3	0	22	1			
Alcoholism	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	0		
Heart Diseases	1	0	2	1	0	1	1	1	0	0	0	1	0	1	2	0	0	0	0	1	1	0	0	0	0	0	0	0	1	0	0	0	0	0	8	0	
Erysipelas	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
Cancer	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
Cerebro - Spinal Fevers	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0		
Remittent and Intermittent Fevers	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
Typhoid Fever	0	1	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	3	
Typho - Malarial Fever	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	
Whooping-Cough	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Smallpox	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Measles	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Scarlet Fever	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Croup	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	
Diphtheria	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	
Other Diseases of St'mach & Bow'ls	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11	0
Cholera Infantum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Diarrhoea and Dysentery	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Congestion of the Lungs	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acute Bronchitis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acute Pneumonia	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Consumption	2	0	0	0	0	1	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Total Deaths	14	7	4	4	4	4	6	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	
Estimated Population	11,900	5,000	3,000	1,601	2,000	2,000	6,000	500	2,040	1,554	10,000	1,567	400	10,000	3,000	10,796	1,960	700	7,000	2,500	1,625	250	400	2,000	500	53,394	300	425	1,200	2,000	325	50,000	1,000	1,000			
LOCATIONS AND AUTHORITIES.	Alameda, Dr. John T. McLean.	Anaheim and vicinity, Dr. J. H. Bullard.	Antioch and vicinity, D. W. S. George.	Auburn, Dr. A. S. Waldo.	Azusa and vicinity, Dr. J. H. Miller.	Bakersfield, Dr. C. A. Rogers.	Berkeley, Dr. F. H. Payne.	College City, Dr. C. H. Gibbons.	Colton, Dr. M. F. Price.	Cloverdale and vic., Dr. R. S. Markell.	Chico and vicinity, Dr. William King.	Dixon, Dr. A. Trafton.	Etna Mills, Dr. E. W. Bathurst.	Eureka and vicinity, Dr. S. B. Foster.	Forest Hill and vicinity, Dr. Paul Reudy.	Fresno, Dr. W. S. Maupin.	Folsom, Dr. B. F. Bates.	Galt, Dr. Alex. Montague.	Grass Valley and vic., Dr. W. C. Jones.	Gridley, Dr. J. F. Harris.	Haywards, Dr. G. E. Alexander.	Knights Ferry, Dr. James H. Lowe.	Lockeford, Dr. E. N. Foote.	Long Beach and vic., Dr. J. W. Wood.	Lincoln, Dr. Joseph Flint.	Los Angeles, Dr. G. MacGowan.	Middletown, Dr. R. E. Hartley.	Mariposa, Dr. W. J. Kearney.	Monterey, Dr. Sidney H. Smith.	Martinez and vicinity, Dr. J. B. Tennant.	Needles, Dr. James P. Booth.	Oakland, Dr. J. P. H. Dunn.	Oakdale, Dr. R. H. Endicott.				

Other Causes	1 2 2 1 1 0 1 2 24 6 239 26 4 3 1 5 3 1 2 3 3 18 1 1 1 2 5 0 2 0	473
Alcoholism	0 0 0 0 0 1 0 0 0 0 5 0 0 0 0 0 0 0 0 0 0 0 1 0 1 0 0 0 0 0 0	12
Heart Diseases	0 1 1 1 0 0 0 0 1 0 43 4 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	80
Erysipelas	0 0	0
Cancer	0 0 1 0 0 1 0 0 1 0 21 2 0 0 0 0 2 0 1 0 0 0 0 0 0 0 0 0 0 0 0	45
Cerebro - Spinal Fevers	0 0 0 0 0 1 0 0 2 1 2 0	10
Remittent and Intermittent Fevers	0 0 0 0 0 2 0	2
Typhoid Fever	0 2 0 0 1 0 0 1 3 0 20 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	38
Typho - Malarial Fever	0 0 0 0 0 0 0 0 0 0 3 0	5
Whooping-Cough	0 0 0 0 0 1 0 0 0 0 2 0	5
Smallpox	0 0	0
Measles	0 0 0 0 0 0 0 0 0 0 3 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	7
Scarlet Fever	0 0 0 0 0 0 0 1 0	5
Croup	0 0 0 0 0 0 0 0 0 0 0 8 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	10
Diphtheria	0 0	34
Other Diseases of Stomach & Bowels	0 0 1 1 0 0 0 0 0 5 0 56 2 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	89
Cholera Infantum	0 0 0 1 0 0 0 0 0 3 0 40 6 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	62
Diarrhoea and Dysentery	0 0 0 1 0 0 0 0 0 2 1 9 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	16
Congestion of the Lungs	0 0 0 0 0 0 0 0 0 0 3 0	5
Acute Bronchitis	0 0 0 0 0 0 0 0 0 0 10 0	12
Acute Pneumonia	0 0 1 1 0 0 0 0 0 1 0 33 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	45
Consumption	0 3 0 0 0 2 0 0 0 4 1 0 74 7 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	141
Total Deaths	1 8 6 6 6 2 8 2 3 46 9 580 12 3 0 1 1 1 1 1 1 31 2 2 3 3 3 1 1 1	1,096
Estimated Population	2,000 7,000 8,000 5,000 5,000 3,000 1,900 800 26,272 16,150 330,000 18,027 3,004 7,000 1,700 10,900 5,864 2,000 5,594 5,216 14,376 1,000 1,300 300 5,904 7,000 4,500 2,500 600	685,866
LOCATIONS AND AUTHORITIES.	Groville, Dr. J. H. M. Karsner. Pasadena and vic., Dr. Henry Sherk. Petaluma and vicinity, Dr. L. H. Patty. Pomona and vicinity, Dr. R. F. Rose. Red Bluff and vicinity, Dr. J. M. West. Redding and vicinity, Dr. F. P. Mitchell. Rio Vista and vicinity, Dr. S. C. Brown. Rocklin, Dr. A. M. Stafford. Sacramento, Dr. C. B. Nichols. San Diego, Dr. Thomas L. Magee. San Francisco, Dr. J. W. Keeney. San José, Dr. J. R. Curnow. San Luis Obispo, County Recorder. San Pedro, Dr. R. W. Hill. Santa Monica, Dr. M. Thornburg. Santa Ana and vicinity, Dr. J. G. Bailey. Santa Barbara, Dr. R. F. Winchester. Santa Paula and vicinity, Dr. D. W. Mott. Santa Cruz, Dr. C. L. Anderson. Santa Rosa, Dr. R. P. Smith. Stockton, Dr. C. A. Ruggies. Susan, Dr. J. W. B. Reynolds. Truckee and vicinity, Dr. W. Curless. Upper Lake, Dr. R. G. Reynolds. Vallejo, Dr. W. D. Anderson. Ventura and vic., Dr. A. J. Comstock. Vacaville and Elmira, Dr. J. W. Stitt. Watsonville, Dr. W. D. Rodgers. Williams, Dr. A. W. Kimball.	
Totals	685,866	

AUGUST, 1891.

Mortality reports from 66 cities, towns, and localities, aggregating a population of 706,054, show the total number of deaths in August, from all causes, to have been 975. That is 1.38 per cent per 1,000 for the month, and 16.56 per cent for the year.

There were 122 due to consumption, 52 to pneumonia, 19 to bronchitis, 15 to congestion of the lungs, 19 to diarrhoea and dysentery, 48 to cholera infantum, 59 to other diseases of the stomach and bowels, 25 to diphtheria, 6 to croup, 2 to scarlatina, 3 to measles, 7 to whooping-cough, 37 to typhoid fever, 3 to malarial fevers, 5 to cerebro-spinal fever, 30 to cancer, 3 to erysipelas, 85 to heart disease, 8 to alcoholism, and 430 to all other causes.

PREVAILING DISEASES.

Reports from 53 localities show 49 cases of cholera infantum, 155 of diarrhoea, 65 of cholera morbus, and 37 of dysentery.

Measles was reported from Middletown, Santa Cruz, Dixon, Fresno, and Mariposa. Scarlatina was reported from 2 places only, St. Helena and Rio Vista. It has prevailed also in Sacramento during August.

Diphtheria has been reported from Alvarado as epidemic. Truckee reported 15 cases, Pomona 6. Willows has had 43 cases, but none have been reported, owing to the absence of the Health Officer.

Whooping-cough is scattered quite generally over the State. There were 25 cases in Pomona, 10 in Downey, 4 in Fresno, 20 in Lockeford, 8 in Red Bluff, 12 in Galt, and was heard from at Santa Rosa and San Diego. Ninety-four cases were reported in all. It was reported as epidemic at Elk Grove.

Seventeen cases of erysipelas were reported, 52 of typhoid fever, 368 of malarial fevers, 3 of cerebro-spinal fever, 5 of pneumonia, 7 of congestion of the lungs, 63 of bronchitis, 24 of influenza, and 6 of rheumatism.

Abstract of the Reports of Deaths and their Causes in California during August, 1891.

LOCATIONS AND AUTHORITIES.	Estimated Popu- lation	Total Deaths	Consumption.....	Acute Pneumonia.	Acute Bronchitis..	Congestion of the Lungs	Diarrhoea and Dys- entery.....	Cholera Infantum.	Other Diseases of St'mach & Bow'ls	Diphtheria	Croup.....	Scarlet Fever	Measles.....	Smallpox	Whooping-Cough..	Typho - Malarial Fever.....	Typhoid Fever	Remittent and In- termittent Fevers	Cerebro - Spinal Fever.....	Cancer	Erysipelas.....	Heart Diseases	Alcoholism.....	Other Causes
Alturas, Dr. John M. Forrest.....	512	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Alameda, Dr. John T. McLean.....	11,900	16	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Anaheim and vicinity, Dr. J. H. Bullard.....	6,000	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Antioch and vicinity, Dr. W. S. George.....	3,000	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Auburn, Dr. A. S. Waldo.....	1,601	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Azusa and vicinity, Dr. J. H. Miller.....	2,000	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bakersfield, Dr. C. A. Rogers.....	2,000	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Benicia, Dr. Edward Gray.....	2,800	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Berkeley, Dr. F. H. Payne.....	6,000	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Calico, Dr. A. E. Rhea.....	600	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Colton and vicinity, Dr. M. F. Price.....	2,040	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Colusa, Dr. R. A. Gray.....	2,000	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cottonwood and vicinity, Dr. J. O. Smith.....	1,250	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cloverdale and vicinity, Dr. R. S. Markell.....	1,554	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chico and vicinity, Dr. William King.....	10,000	11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dixon, Dr. A. Iration.....	1,567	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Downville, Dr. Alembly Jump.....	1,000	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Downey and vicinity, Dr. Q. J. Rowley.....	2,500	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Etna Mills, Dr. E. W. Bathurst.....	400	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Elk Grove, Dr. J. H. McKee.....	300	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eureka and vicinity, Dr. S. B. Foster.....	10,000	13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Forest Hill and vicinity, Dr. Paul Reudy.....	3,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fresno, Dr. W. S. Maupin.....	10,796	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Folsom, Dr. B. F. Bates.....	1,980	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Galt, Dr. Alex. Montague.....	700	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grass Valley and vic., Dr. W. C. Jones.....	7,000	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Haywards, Dr. G. E. Alexander.....	1,625	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lockeford, Dr. E. N. Foote.....	400	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lincoln, Dr. Jos. Flint.....	500	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Long Beach and vic., Dr. J. W. Wood.....	2,000	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lodi and vicinity, Dr. E. A. Burchard.....	1,200	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Los Angeles, Dr. G. MacGowan.....	53,334	52	11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Middletown, Dr. R. E. Hartley.....	1,800	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Mariposa, Dr. W. J. Kearney.....	425	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Monterey, Dr. Sidney H. Smith.....	1,200	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Napa, Dr. M. B. Pond.....	4,387	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Needles, Dr. James P. Booth.....	325	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Oakland, Dr. J. P. H. Dunn.....	50,000	67	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pasadena and vicinity, Dr. Henry Sherk.....	10,000	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pleasanton and vicinity, Dr. W. H. Cope.....	800	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pomona and vicinity, Dr. R. F. Rose.....	5,000	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Red Bluff and vicinity, Dr. J. M. West.....	1,861	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Redding, Dr. F. P. Mitchell.....	1,900	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rio Vista and vicinity, Dr. S. C. Brown.....	26,272	27	3	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sacramento, Dr. C. B. Nichols.....	3,000	11	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
San Bernardino, Dr. C. C. Wainwright.....	21,000	11	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
San Diego, Dr. Thos. L. Magee.....	330,000	550	66	38	14	14	14	25	32	13	6	1	0	0	0	0	0	0	0	0	0	0	0	0
San Francisco, Dr. J. W. Keeney.....	18,027	34	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
San José, Dr. J. R. Curnow.....	3,004	6	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
San Luis Obispo, County Recorder.....	1,700	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Santa Monica, Dr. E. C. Folsom.....	2,000	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Santa Paula and vicinity, Dr. D. W. Mott.....	15,000	6	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Santa Ana and vicinity, Dr. J. S. Bailey.....	5,864	12	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Santa Barbara, Dr. R. F. Winchester.....	5,594	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Santa Cruz, Dr. C. L. Anderson.....	5,216	4	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Santa Rosa, Dr. R. P. Smith.....	2,000	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sausalito and vic., Dr. H. J. Crumpton.....	14,376	25	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Stockton, Dr. C. A. Ruggles.....	2,200	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
St. Helena and vic., Dr. J. G. Dawson.....	300	4	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sequel, Dr. H. O. Brink.....	3,000	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tulare City, Dr. C. F. Taggart.....	300	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Upper Lake, Dr. R. G. Reynolds.....	5,904	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Vallejo, Dr. W. D. Anderson.....	4,500	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Vacaville and Elmira, Dr. J. W. Stitt.....	4,500	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Watsonville, Dr. W. D. Rodgers.....	4,500	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Woodbridge and vicinity, Dr. S. E. Lotta.....	1,000	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	708,054	975	122	52	19	15	19	48	59	25	6	2	3	0	7	4	33	3	5	30	3	82	8	430

SEPTEMBER, 1891.

Mortality reports from 63 cities, towns, villages, and localities, having an aggregate population of 675,551, show the total number of deaths from all causes in September to have been 929, making a death rate per 1,000 of 16.44 per annum.

Consumption was the cause of death in 129 cases, pneumonia in 38, bronchitis 13, congestion of the lungs 3, diarrhoea and dysentery in 30, cholera infantum in 30, other diseases of the stomach and bowels 63, diphtheria 33, membranous croup 10, whooping-cough 6, typhoid fever 28, malarial fevers 7, cerebro-spinal fever 3, cancer 20, erysipelas 3, heart disease 73, alcoholism 8, and from all other causes 444.

PREVAILING DISEASES.

Reports from 55 localities give 30 cases of cholera infantum, 168 of diarrhœa, 47 of cholera morbus, 41 of dysentery, 29 of measles, 10 of scarlatina, 26 of diphtheria, 18 of membranous croup, 31 of whooping-cough, 12 of erysipelas, 39 of typhoid fever, 379 of malarial fevers, 2 of cerebral fever, 11 of pneumonia, 62 of bronchitis, 9 of congestion of the lungs, 42 of influenza, and 5 of rheumatism.

In the foregoing typho-malarial fever is classed as typhoid fever, and intermittent and remittent fevers as malarial fevers.

Abstract of the Reports of Deaths and their Causes in California during September, 1891.

LOCATIONS AND AUTHORITIES.		Abstract of the Reports of Deaths and Mortality in California, 1899.	
		1899.	1900.
Alturas, Dr. John M. Forrest.	512	0	0
Alameda, Dr. John T. McLean.	11,900	7	3
Anaheim and vicinity, Dr. J. H. Bullard.	5,000	3	2
Auburn, Dr. A. S. Waldo.	1,601	0	3
Azusa and vicinity, Dr. J. H. Miller.	2,000	12	0
Bakersfield and vic., Dr. C. A. Rogers.	3,800	2	0
Benicia and vicinity, Dr. Edward Gray.	2,800	3	1
Colton and vicinity, Dr. M. F. Price.	2,800	1	1
Cottonwood and vic., Dr. J. O. Smith.	1,200	12	0
Chico and vicinity, Dr. William King.	8,880	1	0
Dixon, Dr. A. Trafton.	1,567	3	1
Downeyville, Dr. Alenby Jump.	1,000	3	3
Downey and vicinity, Dr. Q. J. Rowley.	2,500	2	0
Etna Mills, Dr. E. W. Bathurst.	400	0	0
El Monte and vicinity, Dr. R. D. Adams.	1,000	9	3
Eureka and vicinity, Dr. S. B. Foster.	10,000	3	1
Elinsore and vicinity, Dr. T. E. Ellis.	800	0	0
Forest Hill and vic., Dr. Paul Reudy.	3,000	2	0
Fresno, Dr. W. S. Maupin.	10,796	13	3
Folsom, Dr. B. F. Bates.	1,980	1	0
Gait, Dr. Alex. Montague.	700	0	0
Grass Valley and vic., Dr. W. C. Jones.	7,000	6	1
Gonzales, Dr. C. A. E. Hertel.	350	2	1
Haywards, Dr. G. E. Alexander.	1,625	7	1
Long Beach and vic., Dr. J. W. Wood.	2,000	3	0
Lodi and vicinity, Dr. E. A. Burchard.	1,200	1	0
Los Angeles, Dr. G. MacGowan.	53,394	74	14
Monterey, Dr. Sidney H. Smith.	1,200	3	0
Needles and vic., Dr. James P. Booth.	750	0	0
Oakland, Dr. J. F. H. Dunn.	50,000	53	7
Ontario and vicinity, Dr. C. D. Watson.	2,000	3	1
Pasadena and vic., Dr. Henry H. Sherk.	13,000	12	3
Peraluna and vicinity, Dr. L. H. Patty.	8,000	1	0
Other Causes.	81	2	0
Alcoholism.	25	1	0
Heart Diseases.	3	0	0
Erysipelas.	0	0	0
Cancer.	0	0	0
Cerebro-Spinal Fevers.	0	0	0
Remittent and Intermittent Fevers.	0	0	0
Typhoid Fever.	0	0	0
Typho-Malarial Fever.	0	0	0
Whooping-Cough.	0	0	0
Smallpox.	0	0	0
Measles.	0	0	0
Scarlet Fever.	0	0	0
Croup.	0	0	0
Diphtheria.	0	0	0
Other Diseases of St'mach & Bow'ls.	0	0	0
Cholera Infantum.	0	0	0
Diarrhœa and Dysentery.	0	0	0
Congestion of the Lungs.	0	0	0
Acute Bronchitis.	0	0	0
Acute Pneumonia.	0	0	0
Consumption.	0	1	0
Total Deaths.	0	7	3
Estimated Population.			

OCTOBER, 1891.

Mortality reports from 71 cities, towns, villages, and localities, having an aggregate population of 700,563, show the total number of deaths from all causes in October to have been 1,077, making a death rate of 1.53 per 1,000 for the month, or 18.36 per 1,000 per annum.

Consumption was the cause in 158 cases, acute pneumonia in 67, acute bronchitis in 20, congestion of the lungs in 4, diarrhœa and dysentery in 22, cholera infantum in 36, other diseases of the stomach and bowels in 73, diphtheria in 46, croup in 15, scarlatina in 1, measles in 6, whooping-cough in 1, typhoid fever in 29, remittent and intermittent fevers in 4, cerebro-spinal fever in 7, cancer in 40, heart disease in 67, alcoholism in 10, and all other causes 471.

PREVAILING DISEASES.

Reports from 63 localities give 7 cases of cholera infantum, 139 of diarrhœa, 45 of dysentery, 31 of measles, 20 of scarlatina, 48 of diphtheria, 3 of croup, 33 of whooping-cough, 24 of erysipelas, 46 of typhoid fever, 272 of malarial fevers, 7 of cerebro-spinal fever, 30 of pneumonia, 83 of bronchitis, 4 of congestion of the lungs, and 66 of influenza.

ABSTRACT FOR SEPTEMBER, 1891—Continued.

LOCATIONS AND AUTHORITIES.	Estimated Popu- lation	Total Deaths	Consumption	Acute Pneumonia.	Acute Bronchitis..	Congestion of the Lungs	Diarrhoea and Dys- entery	Cholera Infantum.	Other Diseases of St'mach & Bow'ls	Diphtheria	Croup	Scarlet Fever	Measles	Smallpox	Whooping-Cough..	Typho- Malarial Fever	Typhoid Fever	Remittent and In- termittent Fevers	Cerebro- Spinal Fev'rs	Cancer	Erysipelas	Heart Diseases	Alcoholism	Other Causes
Pleasanton, Dr. W. H. Cope	800	2	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pomona and vicinity, Dr. R. F. Rose	5,000	6	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
Red Bluff and vicinity, Dr. J. M. West	5,000	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Redding and vicinity, Dr. F. P. Mitchell	5,000	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Rio Vista and vicinity, Dr. S. C. Brown	1,900	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Sacramento, Dr. C. B. Nichols	26,272	33	5	0	0	0	0	0	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	19
San Bernardino, Dr. C. C. Wainwright	3,000	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
San Diego, Dr. Thos. L. Magee	16,153	11	2	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5
San Francisco, Dr. J. W. Keeney	300,000	465	60	27	11	0	15	0	47	0	6	0	0	0	1	0	0	0	2	11	0	0	0	207
San José, Dr. J. R. Curnow	18,027	37	9	0	0	0	0	12	1	18	0	0	0	0	0	0	0	0	0	0	0	0	0	21
San Luis Obispo, County Recorder	3,004	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
Santa Paula and vic, Dr. D. W. Mott	2,000	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
San Pedro and vicinity, Dr. R. W. Hill	1,500	12	1	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
Santa Ana and vicinity, Dr. J. G. Bailey	15,000	7	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Santa Barbara, Dr. R. F. Winchester	5,684	6	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9
Santa Clara, Dr. C. L. Anderson	5,394	7	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
Santa Maria, Dr. M. Thornburg	1,000	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6
Santa Rosa, Dr. R. P. Smith	5,216	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Sausalito and vic, Dr. H. J. Crumpton	2,000	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10
Selma and vicinity, Dr. E. E. Brown	3,000	4	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Stockton, Dr. C. A. Ruggles	14,376	22	2	1	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	13
St. Helena and vic, Dr. J. G. Dawson	2,800	6	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Suisun and vic, Dr. J. W. B. Reynolds	2,000	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
Truckee and vicinity, Dr. W. Curless	1,300	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Tulare City, Dr. C. F. Taggart	3,000	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
Upper Lake, Dr. R. G. Reynolds	300	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Valejo, Dr. W. D. Anderson	5,500	11	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9
Vacaville and Elmira, Dr. J. W. Stitt	4,500	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Watsonville, Dr. W. D. Rodgers	2,000	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Wheatland and vicinity, Dr. L. Melton	1,000	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Totals	675,551	929	129	38	13	3	18	30	63	33	10	0	0	0	6	5	23	7	3	20	3	3	8	444

Abstract of the Reports of Deaths and their Causes in California during October, 1891.

LOCATIONS AND AUTHORITIES.	Estimated Popula- tion	Consumption	Acute Pneumonia.	Acute Bronchitis.	Congestion of the Lungs	Diarrhoea and Dys- entery	Cholera Infantum.	Other Diseases of St'mach & Bow'ls	Diphtheria	Croup	Scarlet Fever	Measles	Smallpox	Whooping-Cough..	Typho - Malarial Fever.....	Typhoid Fever	Remittent and Inter- mittent Fevers	Cerebro - Spinal Fevers .	Cancer	Erysipelas.....	Heart Diseases ...	Alcoholism.....	Other Causes
Alturas, Dr. John M. Forrest	2,280	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Alameda, Dr. John T. McLean	11,900	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Anaheim and vicinity, Dr. J. H. Bullard	5,000	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Antioch and vicinity, Dr. W. S. George	1,000	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Auburn, Dr. A. S. Waldo	1,601	4	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Azusa and vicinity, Dr. J. H. Miller	2,000	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bakersfield and vicinity, Dr C. A. Rogers	2,000	6	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Benicia and vicinity, Dr. Edward Gray	2,591	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Berkley, Dr. F. H. Payne	5,500	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Calico, Dr. A. R. Rhea	600	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Colton and vicinity, Dr. M. E. Price	2,000	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cottonwood and vicinity, Dr. J. O. Smith	1,200	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gloverdale, Dr. R. S. Markell	1,500	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chico and vicinity, Dr. William King	8,880	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dixon, Dr. A. Trafton	1,567	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Downville and vicinity, Dr. A. Jump	1,000	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Downey and vicinity, Dr. Q. J. Rowley	2,500	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Etna Mills, Dr. E. W. Bathurst	400	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
El Monte and vicinity, Dr. R. D. Adams	1,000	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eureka and vicinity, Dr. S. B. Gaston	10,000	14	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Elsmore and vicinity, Dr. T. E. Ellis	800	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Forest Hill and vicinity, Dr. Paul Reudy	3,000	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fresno, Dr. W. S. Maupin	10,796	15	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Folsom, Dr. B. F. Bates	1,960	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Galt, Dr. Alex. Montague	700	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grass Valley and vicinity, Dr. Thomas-	7,000	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gonzales, Dr. E. A. E. Hertel	850	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Haywards, Dr. G. E. Alexander	1,200	6	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Jackson and vicinity, Dr. E. B. Roberts	2,600	6	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lockeford, Dr. E. N. Foote	400	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Long Beach and vicinity, Dr. J. W. Wood	2,000	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lodi and vicinity, Dr. E. A. Burchard	1,200	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Los Angeles, Dr. G. MacGowan	53,384	64	2	1	0	5	0	3	0	0	0	0	0	0	0	0	0	0	1	0	0	0	31

[illegible]

NOVEMBER, 1891.

Mortality reports from 109 cities, towns, villages, and localities, having an aggregate population of 739,577, show the total number of deaths from all causes in November to have been 1,099, making a death rate of 1.47 per 1,000 for the month, or 17.64 per 1,000 per annum.

There were 178 deaths due to consumption, 76 to acute pneumonia, 39 to acute bronchitis, 6 to congestion of the lungs, 18 to diarrhœa and dysentery, 14 to cholera infantum, 46 to other diseases of the stomach and bowels, 35 to diphtheria, 25 to croup, 5 to scarlatina, 2 to measles, 4 to whooping-cough, 37 to typhoid fever, 5 to malarial fevers, 4 to cerebro-spinal fever, 45 to cancer, 83 to heart disease, 12 to alcoholism, and 471 to all other causes.

PREVAILING DISEASES.

Reports from 97 localities outside of the large cities give 45 cases of cholera morbus, 26 of cholera infantum, 168 of diarrhoea, 69 of dysentery, 45 of measles, 63 of scarlatina, 80 of diphtheria, 11 of croup, 132 of whooping-cough, 25 of erysipelas, 2 of typhus fever, 86 of typhoid fever, 213 of malarial fevers, 3 of cerebro-spinal fever, 76 of rheumatism, 140 of pneumonia, 14 of pleurisy, 235 of bronchitis, 15 of congestion of the lungs, 6 of enteritis, 13 of nephritis, 115 of tonsillitis, 65 of neuralgia, and 449 of la grippe.

A mild type of scarlatina prevailed quite generally throughout the State, there being but five fatalities reported. Whooping-cough has been reported as epidemic in several localities. Diseases of the respiratory organs have been very numerous; also diseases of the stomach and bowels. These may, in the majority of cases, be attributed to the quite general prevalence of la grippe, 449 cases of which were reported. It was reported as epidemic in 15 localities where the number of cases was not given. It is reported as being very frequently associated with bronchitis and pneumonia. Rheumatism and neuralgia have been quite generally prevalent. No cases of smallpox have been known to exist in the State for several months, and the entire United States has been quite free from this dreaded malady during the year. The Province of Quebec has, however, had 135 cases, all arising from one person that started the contagion. During November it has been reported in New Jersey, Pennsylvania, Ohio, Tennessee, and Texas. It will doubtless be controlled as far as practicable, but all efforts in that direction have in the past proven of no avail where unvaccinated people have been exposed to the disease. It is quite as likely to leap across the continent as to leap from Quebec to Texas, and this likelihood should be a sufficient warning for those who are unprotected to be vaccinated without delay. There should be a more strict compliance with the law denying admittance to unvaccinated children in the public schools. This should be done without exciting unnecessary alarm, but the necessity for such action should be generally understood, and be insisted upon, especially in the schools.

EXTRACTS FROM WEATHER BUREAU REPORT.

TEMPERATURE.—The weather averaged warmer than usual in November in all districts west of the Rockies.

PRECIPITATION.—No appreciable precipitation fell at Los Angeles during November; San Diego had .10 of an inch; Fresno, .20; San Francisco, .60; Sacramento and Red Bluff, .50. Northern California, San Francisco, and Red Bluff, show deficiencies of 2.25 and 2.34, respectively.

Considering the seasonal falls to date the following deficiencies are computed: Red Bluff, 4.22 inches; San Francisco, 2.83; Sacramento, 2.18; Los Angeles 1.88; San Diego, 1.45.

DECEMBER PRECIPITATION ON THE PACIFIC SLOPE.—The section of California having the greatest amount of precipitation in December lies just west of the Sierra Nevada range and in the extreme northwest (northern Humboldt and Del Norte Counties); and that having the least lies north of the San Bernardino range, east of eastern Tulare and Kern Counties. The eastern half of San Diego County also usually receives less than an inch of rainfall during the month. Along the coast from Monterey Bay to San Diego there is a general average of 4 inches of rainfall, but north of Monterey Bay along the coast it averages from 5 to 8 inches, except off the point on Cape Mendocino, in Humboldt County, where it is slightly less than 4 inches.

Abstract of the Reports of Deaths and their Causes in California during November, 1891.

LOCATIONS AND AUTHORITIES.	Estimated Popula- tion	Total Deaths	Congestion of the Lungs	Diarrhoea and Dys- entery	Cholera Infantum.	Other Diseases of St'mach & Bow'ls	Diphtheria	Croup	Scarlet Fever	Measles	Smallpox	Whooping-Cough	Typho- Malarial Fever	Typhoid Fever	Remittent and In- termittent Fevers	Cerebro - Spinal Fever.	Cancer	Erysipelas	Heart Diseases	Alcoholism	Other Causes	
Alturas, Dr. John M. Forrest.	550	1												0	1	4	0	0	1	5	0	1
Alameda, Dr. John T. McLean.	11,900	11												0	0	0	0	0	0	0	0	0
Anaheim and vic, Dr. J. H. Bullard	5,000	1												0	0	0	0	0	0	0	0	0
Anderson, Dr. L. J. Tabler	1,000	0												0	0	0	0	0	0	0	0	0
Auburn, Dr. A. S. Waldo	1,601	3												0	0	0	0	0	0	0	0	0
Bakersfield and vic., Dr. C. A. Rogers.	3,900	6		1										0	0	0	0	0	0	0	0	0
Benicia and vic, Dr. Edward Gray	2,700	1		0										0	0	0	0	0	0	0	0	0
Calistoga and vic, Dr. F. W. Mitchell	2,000	1												0	0	0	0	0	0	0	0	0
Cedarville, Dr. A. Gibson	200	0												0	0	0	0	0	0	0	0	0
Colton and vicinity, Dr. M. F. Price.	2,000	4												0	0	0	0	0	0	0	0	0
College City and vic, Dr. C. H. Gibbons	1,000	0												0	0	0	0	0	0	0	0	0
Colusa, Dr. S. A. Gray	1,332	2												0	0	0	0	0	0	0	0	0
Cottonwood and vic, Dr. J. O. Smith.	1,200	0												0	0	0	0	0	0	0	0	0
Cloverdale, Dr. R. S. Markell	1,500	1												0	0	0	0	0	0	0	0	0
Chico and vicinity, Dr. William King	8,800	8												0	0	0	0	0	0	0	0	0
Davisville and vicinity, Dr. W. E. Bates	1,500	1												0	0	0	0	0	0	0	0	0
Dixon, Dr. Aug. Traflet	1,567	1												0	0	0	0	0	0	0	0	0
Downville and vic, Dr. Alenby Jump	1,000	1												0	0	0	0	0	0	0	0	0
Downey and vicinity, Dr. Q. J. Rowley	2,500	7												0	0	0	0	0	0	0	0	0
Elma Mills, Dr. E. W. Bathurst	400	2												0	0	0	0	0	0	0	0	0
El Monte and vicinity, Dr. R. D. Adams	1,000	1												0	0	0	0	0	0	0	0	0
Elk Grove, Dr. J. A. McKee	200	0												0	0	0	0	0	0	0	0	0
Eureka and vicinity, Dr. S. B. Foster.	10,000	7												0	0	0	0	0	0	0	0	0
Elsinore and vicinity, Dr. Thos. E. Ellis.	1,000	1												0	0	0	0	0	0	0	0	0
Forest Hill and vic., Dr. Paul Ready	3,000	0												0	0	0	0	0	0	0	0	0
Ft. Bidwell and vic, Dr. W. J. Wakeman	1,500	0												0	0	0	0	0	0	0	0	0
Fresno, Dr. W. F. Maupin	10,796	13												0	0	0	0	0	0	0	0	0
Galt, Dr. Alex. Montague	700	1												0	0	0	0	0	0	0	0	0
Grass Valley and vic., Dr. W. R. Thomas	7,000	6												0	0	0	0	0	0	0	0	0
Glendora, Dr. J. H. Miller	100	3												0	0	0	0	0	0	0	0	0
Gonzales, Dr. C. A. E. Hertel	350	0												0	0	0	0	0	0	0	0	0
Gridley, Dr. J. T. Harris	700	0												0	0	0	0	0	0	0	0	0
Haywards, Dr. G. E. Alexander	1,625	10												0	0	0	0	0	0	0	0	0

DECEMBER, 1891.

Mortality reports from 115 cities, towns, villages, and localities, having an aggregate population of 796,518, show the number of deaths from all causes in December to have been 1,752, making a death rate of 2.19 per 1,000 for the month, or 26.28 per 1,000 per annum.

There were 235 deaths due to consumption, 340 to acute pneumonia, 100 to acute bronchitis, 31 to congestion of the lungs, 11 to diarrhœa and dysentery, 12 to cholera infantum, 59 to other diseases of the stomach and bowels, 58 to diphtheria, 14 to croup, 5 to scarlatina, 4 to measles, 2 to whooping-cough, 36 to typhoid fever, 4 to malarial fevers, 5 to cerebro-spinal fever, 30 to cancer, 2 to erysipelas, 113 to diseases of the heart, 17 to alcoholism, and 674 to all other causes. Of the deaths placed under other causes, la grippe is responsible directly for 49, and indirectly to the greatly increased mortality from respiratory diseases.

November reports showed 199 deaths from diseases of the lungs; December 706. There is also an increase in diphtheria over November, from 35 to 58. Deaths from croup dropped down from 25 in November to 14 in December. There is also a reduction of 5 in the number of deaths from typhoid fever. There is, however, a marked increase in deaths from diseases of the heart, 113 being reported in December against 83 in November. This has no doubt a relation to la grippe and diseases of the respiratory organs.

It would appear that if it were not the prevailing epidemic with its accompanying bronchitis, pneumonia, tonsilitis, and protean perturbing influences upon the human economy, the public health would be above the average.

PREVAILING DISEASES.

Reports from 105 towns, villages, and localities outside of the larger cities, give 8 cases of inflammation of the bowels, 5 of inflammation of the brain, 5 of cholera morbus, 17 of cholera infantum, 65 of diarrhoea, 22 of dysentery, 1 of smallpox, 74 of measles, 51 of scarlatina, 36 of diphtheria, 14 of croup, 1,791 of influenza, 50 of whooping-cough, 23 of erysipelas, 61 of typhoid fever, 139 of malarial fevers, 12 of cerebro-spinal fever, 74 of tonsillitis, 24 of inflammation of the kidneys, 20 of neuralgia, 12 of pleurisy, 244 of pneumonia, 42 of rheumatism, 238 of bronchitis, 15 of congestion of the lungs, and 43 of chickenpox.

Diseases of the stomach and bowels have decreased, and diseases of the respiratory organs have largely increased, with a corresponding increase in fatalities. La grippe is greatly responsible for this increase. In addition to the 1,791 cases of this disease enumerated by reporters, it is reported prevalent or epidemic, and associated in a greater or less degree with bronchitis, pneumonia, and tonsillitis, in Ione, Livermore, Alturas, Tulare, Cloverdale, St. Helena, Biggs, Anaheim, Monterey, Martinez, San Mateo, San Rafael, Santa Maria, Soquel, Santa Cruz, National City, Knights Ferry, Azusa, Watsonville, Gridley, Benicia, Downieville, Modesto, Jackson, Marysville, Halfmoon Bay, Stockton, Petaluma, Solano County, Healdsburg, Pasadena, Santa Rosa, Forest Hill, San Diego, Anaheim, Napa, Elk Grove, Ventura, Sebastopol, and Etna Mills. This is without taking into account San Francisco, Los Angeles, Oakland, Sacramento, and San José, where it has, by common report, prevailed quite as generally as it has among those reported from. This would run the number up into the thousands, and would account for the increased death rate from diseases of the lungs. The sequels of the epidemic will appear in the death rates of several future months under other names, but they will, nevertheless, follow as a result of la grippe. It is quite reasonable to presume that the height of intensity of the epidemic has been reached, and that it will subside from want of material to work upon. So large a percentage of the population having had the disease makes this supposition warrantable. But one case of smallpox is reported in the State, and that is in quarantine at the Sacramento Pesthouse. He came recently from the vicinity of Tulare to Sacramento. Those cases that occurred among the Chinese passengers on board ship from China to San Francisco have been, and still are, in quarantine near San Francisco. There appears to have been no spread of the disease from that source. Sacramento has for more than twenty-five years enjoyed the benefits of a State law requiring all children, before entering the public schools, to be vaccinated. The result has been that while other cities have suffered from the ravages of the pestilence, resulting in depression of business and interference with traffic, Sacramento has enjoyed comparative immunity. In no instance has the disease spread from the occasional isolated cases that have been discovered. The vaccination law is now in force in the entire State, and it is not too much to hope that the entire population may, before many years, be as fully protected as Sacramento.

EXTRACTS FROM WEATHER BUREAU REPORT.

The month can be classed as having been decidedly stormy and extreme in its conditions. The rains of the month were as follows: Red Bluff 3.8, Sacramento 3.3, San Francisco 5.6, Fresno 4.0, Los Angeles 2.0, San Diego 1.3. This is a deficiency of 1.4 inches in the Sacramento Valley, and from .9 to 1.5 in Southern California, but an excess of 1.7 at Fresno, and .5 at San Francisco. In California the mean temperature was 4° below normal, except on the coast, where it was from 1° to 2° below, and from 4° to 6° below in the interior. The warmest days were the 1st, 11th, 14th, and 15th, and the coldest were the 5th, 6th, 7th, 8th, 24th, 25th, and 26th.

Abstract of the Reports of Deaths and their Causes in California during December, 1891.

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LOCATIONS AND AUTHORITIES.	Estimated Population	Total Deaths	Congestion of the Lungs	Diarrhoea and Dysentery	Cholera Infantum.	Other Diseases of St'mach & Bow'ls	Diphtheria	Croup	Scarlet Fever	Measles	Smallpox	Whooping-Cough	Typho - Malarial Fever.	Typhoid Fever	Remittent and Intermittent Fevers	Cerebro - Spinal Fevers	Cancer	Erysipelas	Heart Diseases	Alcoholism	Other Causes
Jackson and vic., Dr. E. B. Robertson	2,000	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Knights Ferry, Dr. James H. Lowe	250	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Lockeford, Dr. E. N. Foote	400	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Long Beach and vicinity, Dr. J. W. Wood	2,600	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Livermore, Dr. E. M. Keys	1,500	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lancolin and vicinity, Dr. J. E. Hunt	1,000	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Laporte and vicinity, Dr. M. Rinehart	600	4	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Los Gatos and vic., Dr. W. F. Knowles	1,645	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lodi and vicinity, Dr. E. A. Burchard	1,200	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Los Angeles, Dr. G. MacGowan	50,384	112	22	0	0	5	2	0	0	0	0	0	0	0	0	0	0	0	0	0	4
Marysville, Dr. D. Powell	4,000	8	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	88
Merced, Dr. E. S. O'Brien	2,009	12	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Millville, Dr. J. N. Crabb	300	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7
Modesto, Dr. W. J. Wilhite	2,387	13	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mariposa and vicinity, Dr. W. J. Kearney	2,000	3	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10
Middletown and vic., Dr. R. E. Hartley	800	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
Monrovia, Dr. J. T. Stewart	1,000	3	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Monterey, Dr. S. H. Smith	1,200	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Martinez and vicinity, Dr. J. B. Tennant	2,000	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Napa and vicinity, Dr. M. B. Pond	8,000	9	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
National City, Dr. J. W. Keene	1,200	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5
Nevada City and vicinity, Dr. C. L. Muller	3,000	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Newcastle, Dr. M. Schnabel	400	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Oakland, Dr. J. H. P. Dunn	50,000	110	12	0	0	6	0	0	1	0	0	0	1	0	0	0	0	0	0	0	37
Oakdale, Dr. R. H. Endicott	1,000	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Oroville, Dr. J. H. M. Karsner	2,000	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Ontario and vic., Dr. C. D. Watson, H. O.	2,000	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Pasadena and vicinity, Dr. H. H. Sherk	10,000	23	6	2	2	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	1
Petaluma and vicinity, Dr. L. H. Patts	8,000	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Placerville, S. D. No. 2, Dr. S. D. Marks	3,000	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
Plymouth and vic., Dr. W. A. Norman	1,200	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Pleasanton, Dr. Wm. H. Cope	3,420	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
Red Bluff and vicinity, Dr. J. M. West	5,000	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2

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* Including towns reporting no deaths, of an aggregate population of 4,650.

JANUARY, 1892.

Mortality reports from 118 cities, towns, villages, and localities, having an aggregate population of 819,913, show the number of deaths from all causes, in January, to have been 1,622, making a death rate of 1.97 per 1,000 for the month, or 23.64 per 1,000 per annum.

There were 223 deaths due to consumption, 285 to acute pneumonia, 75 to acute bronchitis, 12 to congestion of the lungs, 4 to diarrhoea and dysentery, 6 to cholera infantum, 43 to other diseases of the stomach and bowels, 42 to diphtheria, 16 to croup, 14 to scarlatina, 5 to measles, 7 to whooping-cough, 27 to typhoid fever, 2 to malarial fevers, 10 to cerebro-spinal fever, 44 to cancer, 4 to erysipelas, 110 to diseases of the heart, 12 to alcoholism, 96 to la grippe, and to all other causes 585.

There were 595 deaths from diseases of the lungs in January, as against 706 in December, and 42 from diphtheria, as against 58 in December, and 27 of typhoid fever, as against 36 in December. There was, however, an increase in mortality from la grippe, from 49 in December, to 96 in January. The death rate is, nevertheless, lowered from 2.19, in December, to 1.97 in January.

PREVAILING DISEASES.

Reports from 107 towns, villages, and localities, outside of the larger cities, give 7 of inflammation of the bowels, 5 of cholera morbus, 5 of cholera infantum, 81 of diarrhoea, 19 of dysentery, 102 of measles, 129 of scarlatina, 39 of diphtheria, 20 of croup, 1,798 of influenza, 191 of whooping-cough, 40 of erysipelas, 58 of typhoid fever, 118 of malarial fevers, 9 of cerebro-spinal fever, 174 of tonsillitis, 26 of inflammation of the kidneys, 89 of neuralgia, 35 of pleurisy, 154 of pneumonia, 80 of rheumatism, 381 of bronchitis, 27 of congestion of the lungs, 5 of chickenpox, 16 of pharyngitis, and 3 of inflammation of the brain.

There seems to have been no diminution in the prevalence of influenza, as it is reported from all quarters, and the mortality from that cause has nearly doubled in January.

The smallpox patient admitted to the Sacramento Pesthouse in December has been discharged as cured, and no new cases have appeared. The Chinese at the San Francisco quarantine station have also been discharged. The State is, at this time, free from smallpox.

Abstract of the Reports of Deaths and their Causes in California during January, 1892.

LOCATIONS AND AUTHORITIES.	Other Causes	Alcoholism	Heart Diseases	Erysipelas	Cancer	Cerebro - Spinal Fevers	Remittent and Intermittent Fevers	Typhoid Fever	Typho - Malarial Fever	Whooping-Cough	Smallpox	Measles	Scarlet Fever	Croup	Diphtheria	Other Diseases of St'mach & Bow'ls	Cholera Infantum	Diarrhoea and Dysentery	Congestion of the Lungs	Acute Bronchitis	Acute Pneumonia	Consumption	Total Deaths	Estimated Population
Alturas, Dr. John M. Forrest	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	550
Alameda, Dr. John T. McLean	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	11,900
Alvarado, Dr. Albert Fench	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	600
Anaheim and vicinity, Dr. J. H. Bullard	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	5,000
Antioch and vicinity, Dr. W. S. George	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	3,000
Anderson, Dr. L. J. Tabler	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,000
Auburn, Dr. A. S. Waldo	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,601
Azusa and vicinity, Dr. J. H. Miller	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2,000
Bakersfield and vic., Dr. C. A. Rogers	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3,800
Benicia and vicinity, Dr. Edward Gray	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2,850
Berkeley, Dr. F. H. Payne	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5,500
Calico and vicinity, Dr. A. R. Rhea	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,500
Calistoga and vic., Dr. F. W. Mitchell	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2,000
Cedarville, Dr. A. Gibson	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	200
Colton and vicinity, Dr. M. F. Price	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2,000
College City, Dr. C. H. Gibbons	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,000
Cottonwood and vicinity, Dr. J. O. Smith	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,200
Cloverdale, Dr. R. S. Markell	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,500
Chico and vicinity, Dr. William King	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8,890
Davisville and vicinity, Dr. W. E. Bates	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,500
Dixon and vicinity, Dr. Ang. Traflet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2,500
Downville and vic., Dr. Alembly Jump	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,000
Downey and vicinity, Dr. Q. J. Rowley	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2,500
Etna Mills and vic., Dr. E. W. Bathurst	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,000
Elk Grove, Dr. J. H. McKee	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,200
Eureka and vicinity, Dr. S. B. Foster	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10,000
Elsinore and vicinity, Dr. Thos. E. Ellis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	800
Forest Hill and vic., Dr. Paul Reudy	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3,000
Fort Bidwell and vic., Dr. Wakeman	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,500
Fresno, Dr. W. F. Maupin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10,796
Folsom, John Harris, H. O.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,200
Galt, Dr. Alex. Montague	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	700
Grass Valley and vic., Dr. W. R. Thomas	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7,000

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ABSTRACT FOR JANUARY, 1892—Continued.

Other Causes	1 0 1 1 1 0 2	681
Alcoholism	0 0 0 0 0 0 0	12
Heart Diseases	0 0 0 0 0 0 0	110
Erysipelas	0 0 0 0 0 0 0	4
Cancer	0 0 0 0 0 0 0	44
Cerebro-Spinal Fevers	0 0 0 0 0 0 0	10
Remittent and Intermittent Fevers	0 0 0 0 0 0 0	2
Typhoid Fever	0 0 0 0 0 0 0	27
Typho-Malarial Fever	0 0 0 0 0 0 0	0
Whooping-Cough	0 0 0 0 0 0 0	7
Smallpox	0 0 0 0 0 0 0	0
Measles	0 0 0 0 0 0 0	5
Scarlet Fever	0 0 0 0 0 0 0	14
Croup	0 0 0 0 0 0 0	16
Diphtheria	0 0 0 0 0 0 0	42
Other Diseases of St'mach & Bow'ls	0 0 0 0 0 0 0	43
Cholera Infantum	0 0 0 0 0 0 0	6
Diarrhoea and Dysentery	0 0 0 0 0 0 0	4
Congestion of the Lungs	0 0 0 0 0 0 0	12
Acute Bronchitis	0 0 0 0 0 0 0	75
Acute Pneumonia	0 0 0 1 0 0 1	285
Consumption	0 0 1 0 0 0 1	223
Total Deaths	1 0 2 2 1 1 3	1,622
Estimated Population	600 700 1,000 3,000 500 300 5,469	819,913
LOCATIONS AND AUTHORITIES.	Washington and vic., Dr. B. Woodbridge. Wheatland, Dr. Lewis Melton. Winters and vicinity, Dr. Z. T. Magill. Willows and vicinity, Dr. L. P. Tooley. Williams, Dr. A. W. Kimball. Woodbridge, Dr. S. E. Letta. Yuba City and vicinity, Dr. T. P. Perry.	Totals

FEBRUARY, 1892.

Mortality reports from 118 cities, towns, villages, and localities, having an aggregate population of 813,877, show the number of deaths from all causes in February to have been 1,208, making a death rate of 1.48 per 1,000 for the month, or 17.76 per 1,000 per annum.

There were 129 deaths due to consumption, 122 to acute pneumonia, 57 to acute bronchitis, 12 to congestion of the lungs, 2 to diarrhoea and dysentery, 3 to cholera infantum, 43 to other diseases of the stomach and bowels, 42 to diphtheria, 9 to croup, 14 to scarlatina, 14 to measles, 6 to whooping-cough, 17 to typhoid fever, 10 to cerebro-spinal fever, 27 to cancer, 3 to erysipelas, 65 to diseases of the heart, 9 to alcoholism, 29 to la grippe, and to all other causes 535.

The death rate per 1,000 has decreased from 1.97 in January to 1.48 in February.

The most marked reduction in the death rate appears to be in diseases of the respiratory organs. In January there were 595 deaths from diseases of the lungs, while in February there were 380, being a reduction of 215.

The fatalities from la grippe fell from 96 in January to 29 in February, and deaths from diseases of the heart dropped from 110 in January to 65 in February.

PREVAILING DISEASES.

Reports from 109 towns, villages, and localities outside of the larger cities, give 8 cases of inflammation of the bowels, 13 of cholera morbus, 5 of cholera infantum, 84 of diarrhoea, 29 of dysentery, 173 of measles, 37 of scarlatina, 18 of diphtheria, 5 of croup, 558 of influenza, 125 of whooping-cough, 30 of erysipelas, 22 of typhoid fever, 176 of malarial fevers, 118 of tonsillitis, 5 of inflammation of the kidneys, 69 of neuralgia, 34 of pleurisy, 96 of pneumonia, 79 of rheumatism, 224 of bronchitis, 2 of congestion of the lungs, 4 of chickenpox, 20 of pharyngitis, and 6 of inflammation of the brain.

There is a great reduction in the prevalence of la grippe. One thousand seven hundred and ninety-eight cases were reported from the smaller towns in January, and but 558 in February. It is abating everywhere, except in a few localities where the cold weather prevails. Measles and whooping-cough are epidemic in several places. Fresno has an advanced case of leprosy in a Chinese.

LOCATIONS AND AUTHORITIES.

LOCATIONS AND AUTHORITIES.	Other Causes	Alcoholism.....	Heart Diseases	Erysipelas.....	Cancer	Cerebro - Spinal Fevers.....	Remittent and Intermittent Fevers.....	Typhoid Fever.....	Typho - Malarial Fever.....	Whooping-Cough.....	Smallpox	Measles.....	Scarlet Fever	Croup	Diphtheria	Other Diseases of St'mach & Bow'ls.....	Cholera Infantum.....	Diarrhœa and Dysentery.....	Congestion of the Lungs.....	Acute Bronchitis.....	Acute Pneumonia.....	Consumption.....	Total Deaths	Estimated Population
Alturas, Dr. John M. Forrest.....	1	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	550
Alameda, Dr. John T. McLean.....	13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	13	11,900
Anaheimo and vic, Dr. Albert Fouch.....	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	600
Anaheim and vic, Dr. J. H. Bullard.....	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	5,000
Anderson, Dr. O. P. Paulding.....	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1,000
Azusa and vicinity, Dr. J. H. Miller.....	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2,000
Bakersfield and vic, Dr. C. A. Rogers.....	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	3,600
Benicia and vicinity, Dr. Edward Gray.....	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	2,850
Berkeley, Dr. F. H. Payne.....	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	5,500
Calistoga and vic, Dr. F. W. Mitchell.....	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	2,000
Colton and vicinity, Dr. M. F. Price.....	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	2,000
College City, Dr. C. H. Gibbons.....	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1,000
Cottonwood and vic, Dr. J. O. Smith.....	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1,200
Cloverdale, Dr. R. S. Markell.....	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1,500
Chico and vicinity, Dr. William King.....	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	8,890
Downville and vic, Dr. Alembly Jump.....	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1,000
Downey and vicinity, Dr. Q. J. Kowley.....	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2,500
Etna Mills and vic, Dr. E. W. Bathurst.....	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1,000
El Monte and vic, Dr. R. D. Adams.....	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1,660
Elk Grove, Dr. J. H. McKee.....	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	200
Eureka and vicinity, Dr. S. B. Foster.....	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	10,000
Elsinore and vic, Dr. Thomas E. Ellis.....	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	1,000
Forest Hill and vic, Dr. Paul Reudy.....	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	3,000
Fresno, Dr. W. F. Maupin.....	12	5	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	12	10,796
Folsom, John Harris, H. O.....	3	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1,860
Grass Valley and vic, Dr. W. R. Thomas.....	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	7,000
Gonzales, Dr. C. A. E. Hertel.....	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	450
Gridley, Dr. J. T. Harris.....	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	700
Haywards and vic, Dr. G. E. Alexander.....	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	3,800
Healdsburg, Dr. W. B. Coffman.....	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	4,000
Hopland, Dr. C. T. Grant.....	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	520
Holister, Dr. J. H. Tebbetts.....	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	1,771
One and vicinity, Dr. A. L. Adams.....	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1,800

Jackson and vic., Dr. E. E. Robertson.....	2,000
Lockeford, Dr. E. N. Foote.....	400
Long Beach and vic., Dr. J. W. Wood.....	2,600
Livermore, Dr. E. M. Keys.....	1,800
Laporte and vic., Dr. Olando Pearson.....	1,600
Lakeport, Dr. P. H. Thornton.....	1,100
Los Gatos and vic., Dr. F. W. Knowles.....	1,645
Lodi and vicinity, Dr. E. A. Burchard.....	1,900
Los Angeles, Dr. G. MacGowan.....	50,384
Marysville, Dr. D. Powell.....	4,000
Merced, Dr. E. S. O'Brien.....	2,009
Modesto and vic., Dr. W. J. Wilhite.....	4,000
Middletown and vic., Dr. R. E. Hartley.....	800
Madera and vicinity, Dr. J. L. Burtn.....	1,900
Monrovia, Dr. J. T. Stewart.....	1,000
Monterey, Dr. H. S. Smith.....	1,200
Martinez and vic., Dr. J. B. Tennant.....	2,000
Napa, Dr. M. B. Pond.....	4,387
National City, Dr. J. W. Keene.....	1,200
Nevada City and vic., Dr. C. L. Muller.....	3,000
Newcastle, Dr. M. Schnabel.....	400
Needles and vicinity, Dr. Jas. P. Booth.....	750
Oakland, Dr. J. P. Dunn, H. O.....	50,000
Orville, Dr. J. H. M. Karsner.....	2,000
Ontario and vic., Dr. C. D. Watson, H. O.....	2,300
Pasadena and vic., Dr. Henry H. Sherk.....	10,000
Petaluma and vicinity, Dr. L. H. Party.....	8,000
Placerville, S. D. No. 2, Dr. L. D. Marks.....	3,000
Plymouth, Dr. W. A. Norman.....	600
Pomona and vicinity, Dr. R. T. Rose.....	5,000
Pleasanton, Dr. Wm. H. Cope.....	800
Red Bluff and vicinity, Dr. J. M. West.....	5,000
Redding and vic., Dr. F. F. Mitchell.....	3,000
Rio Vista and vicinity, Dr. B. Dozier.....	1,800
Rocklin, Dr. A. M. Stafford.....	1,020
Roseville, Dr. R. H. Ashby.....	450
Sacramento, Dr. C. B. Nichols.....	26,272
S. Bernardino Co., Dr. C. C. Wainwright.....	23,502
San Diego, Dr. Thos. L. Magee.....	16,163
San Francisco, Dr. J. W. Keeney.....	330,000
San José, Dr. J. R. Curnow.....	18,027
San Leandro, O. J. Lynch, B. of H.....	2,500
San Luis Obispo, County Recorder.....	3,000
San Rafael, Dr. W. J. Wickman.....	3,881
Santa Maria, Dr. M. Thornburg.....	1,000

ABSTRACT FOR FEBRUARY, 1892--Continued.

LOCATIONS AND AUTHORITIES.	Other Causes	Alcoholism.....	Heart Diseases	Erysipelas.....	Cancer	Cerebro - Spinal Fevers.....	Remittent and Inter-mittent Fevers.....	Typhoid Fever	Typho - Malarial Fever.....	Whooping-Cough..	Smallpox	Measles.....	Scarlet Fever	Croup.....	Diphtheria	Other Diseases of St'mach & Bow'ls	Cholera Infantum..	Diarrhoea and Dysentery.....	Congestion of the Lungs	Acute Bronchitis..	Acute Pneumonia.	Consumption	Total Deaths	Estimated Population	Totals
Santa Barbara, Dr. R. F. Winchester.....	4	7	0	0	0	9	3	0	1	1	1	5	0	3	3	1	1	1	0	2				1,208	813,877
Santa Cruz and vic, Dr. B. A. Plant, H. O. Santa Rosa, Dr. R. P. Smith.....	0	0	1	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	11	10,000	
Sausalito and vic, Dr. G. C. Macdonald.....	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	6	5,216	
Seama and vicinity.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3	2,000	
Stockton, Dr. C. A. Ruggles.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	22	14	14,376	
St. Helena and vic, Dr. W. J. G. Dawson.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3	2,800	
Suisun and vic, Dr. J. W. B. Reynolds.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	4,000	
Susanville and vic, Dr. A. Milliken.....	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	800	
Sequel and vicinity, Dr. H. O. Brink.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	400	
Truckee and vicinity, Dr. W. Curless.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1,300	
Tulare City, Dr. C. F. Taggart.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	5	2,000	
Upper Lake, Dr. R. G. Reynolds.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	300	
Vallejo and vic, Dr. W. D. Anderson.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	8	8	6,000	
Watsonville and vic, Dr. A. J. Comstock.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	5	5	9,000	
Wentworth and vic, Dr. W. D. Rodgers.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	4	4	2,500	
Winters and vicinity, Dr. Z. T. Magill.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1,000	
Willows and vicinity, Dr. L. P. Tooley.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3	3,000	
Williams, Dr. A. W. Kimball.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	500	
Yuba City, Dr. T. P. Perry.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	700	
Totals	4	7	0	0	0	9	3	0	1	1	1	5	0	3	3	1	1	1	0	2				1,208	813,877

Including the following towns, reporting no deaths: Auburn (pop., 1,601), Biggs (pop., 750), Calico and vicinity (pop., 1,500), Davisville and vicinity (pop., 1,500), Dixon and vicinity (pop., 2,500), Galt (pop., 700), Igo (pop., 200), Knights Ferry (pop., 250), Lincoln and vicinity (pop., 1,000), Millville (pop., 300), Nicolaus (pop., 100), Oakdale (pop., 1,000), Placerville (pop., 1,684), San Mateo and vicinity (pop., 2,000), Santa Paula and vicinity (pop., 2,000), Sebastopol (pop., 500), Sierra Valley and vicinity (pop., 1,000), Vacaville and vicinity (pop., 4,500), Wheatland (pop., 700), Woodbridge (pop., 300).

MARCH, 1892.

Mortality reports from 116 cities, towns, villages, and localities, having an aggregate population of 813,821, show 1,176 deaths from all causes during the month of March. This corresponds to a death rate of 1.44 per 1,000 for March, or 17.28 per 1,000 per annum. There were 191 deaths due to consumption, 89 to pneumonia, 39 to acute bronchitis, 11 to congestion of the lungs, 1 to diarrhea, 1 to cholera infantum, 55 to other diseases of the stomach and bowels, 32 to diphtheria, 10 to croup, 14 to scarlatina, 12 to measles, 8 to whooping-cough, 19 to typhoid fever, 3 to malarial fevers, 4 to cerebro-spinal fever, 34 to cancer, 2 to erysipelas, 109 to diseases of the heart, 9 to alcoholism, 9 to influenza, and 533 to all other causes.

This shows a continued reduction in fatalities from respiratory diseases. In January there were 595 deaths from diseases of the lungs, in February 380, and in March 330.

There were 96 deaths in January from la grippe, 29 in February, and 9 in March. January showed 110 deaths from diseases of the heart, February 65, and March 1

Any reasons that might be advanced for these sudden fluctuations must necessarily be conjectural.

PREVAILING DISEASES.

Reports of prevailing diseases from 105 towns, villages, and localities outside of the large cities, show 60 cases of acute pneumonia, 21 of pleuritis, 209 of acute bronchitis, 5 of congestion of the lungs, 72 of diarrhoea, 30 of dysentery, three of cholera infantum, 4 of cholera morbus, 13 of diphtheria, 8 of croup, 93 of scarlatina, 90 of measles, 141 of whooping-cough, 181 of malarial fevers, 56 of typhoid fever, 6 of cerebro-spinal fever, 23 of erysipelas, 2 of inflammation of the brain, 11 of inflammation of the bowels, 15 of inflammation of the kidneys, 272 of influenza, 73 of neuralgia, 2 of puerperal fever, 79 of rheumatism, 83 of tonsillitis, 30 of pharyngitis, and one of chickenpox.

Measles are reported prevalent at Elk Grove, Monrovia, Watsonville, Folsom, and San Diego.

Sierra Valley reported 25 cases of scarlatina, Wheatland 23, Needles 20, and Santa Rosa 12. Fatalities have been very light, as the fever has been of a mild type.

Whooping-cough has been epidemic at Azusa, and has prevailed to some extent at Monrovia, Martinez, Auburn, Watsonville, and Marysville. Mumps has been reported from many different points.

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APRIL, 1892.

Mortality reports from 117 cities, towns, villages, and localities, having an aggregate population of 789,931, show 1,027 deaths from all causes during the month of April. This corresponds to a death rate of 1.030 per 1,000 for April, or 15.60 per 1,000 per annum.

There were 195 deaths due to consumption, 76 to pneumonia, 35 to acute bronchitis, 10 to congestion of the lungs, 9 to diarrhoea and dysentery, 5 to cholera infantum, 41 to other diseases of stomach and bowels, 26 to diphtheria, 11 to croup, 6 to scarlatina, 9 to measles, 11 to whooping-cough, 15 to typhoid fever, 4 to malarial fevers, 8 to cerebro-spinal fever, 39 to cancer, 2 to erysipelas, 84 to diseases of the heart, 9 to alcoholism, 2 to influenza, and 430 to all other causes.

This shows a continued though small reduction in fatalities from respiratory diseases. In January there were 595 deaths from diseases of the lungs, in February 380, in March 330, and in April 306.

There were 96 deaths in January from la grippe, 29 in February, 9 in March, and 2 in April.

There were 6 deaths from scarlatina in April as against 14 in March.

PREVAILING DISEASES.

Reports of prevailing diseases from 85 towns, villages, and localities outside of the large cities, show 54 cases of acute pneumonia, 21 of pleurisy, 222 of acute bronchitis, 5 of congestion of the lungs, 180 of diarrhoea, 55 of dysentery, 10 of cholera infantum, 19 of cholera morbus, 13 of diphtheria, 20 of croup, 36 of scarlatina, 72 of measles, 87 of whooping-cough, 191 of malarial fevers, 17 of typhoid fever, 1 of cerebro-spinal fever, 49 of erysipelas, 4 of inflammation of the brain, 15 of inflammation of the bowels, 15 of inflammation of the kidneys, 174 of influenza, 76 of neuralgia, 104 of rheumatism, 89 of tonsillitis, and 27 of pharyngitis.

Measles is reported prevalent at Merced and Azusa.

There does not appear to have been any prevailing disease in April, but the temperature was below normal during the entire month, with unusually cloudy weather and damp atmosphere. There have been in consequence considerable rheumatism, neuralgia, and many sore throats.

On April 21st, a case of varioloid was discovered in Berkeley, Alameda County, in a married man, 25 years of age, by occupation a handler of foreign goods. The origin is unknown, but the patient stated to the local Health Officer, Dr. F. H. Payne, that about 10 days before he was attacked, a muffled Chinaman, having sores on his face, took a seat in a car next to him on the local train from San Francisco. No such Chinaman has yet been found. Strict quarantine, isolation, and vaccination were the restrictive and preventive measures adopted, and no new cases have developed yet.

On May 3d a case of varioloid was discovered on a fishing boat, on the Sacramento River, 4 miles above Sacramento City. The afflicted person is a native of the Sandwich Islands, aged 37 years, and came directly from San Francisco. Before being sent to the pesthouse, he walked with a companion from the wharf through 7 blocks of the business portion of the city, and voluntarily presented himself to the local authorities. The isolation of pesthouse regulations has been applied to the patient and his companion.

ABSTRACT FOR MARCH, 1892--Continued.

LOCATIONS AND AUTHORITIES.	Estimated Population	Total Deaths	Consumption.....	Acute Pneumonia.	Acute Bronchitis..	Congestion of the Lungs	Diarrhoea and Dysentery	Cholera Infantum.	Other Diseases of St'mach & Bow'ls	Diphtheria	Croup.....	Scarlet Fever	Measles.....	Smallpox	Whooping-Cough..	Typho - Malarial Fever.....	Typhoid Fever	Remittent and Intermittent Fevers	Cerebro - Spinal Fevers.....	Cancer	Erysipelas.....	Heart Diseases	Alcoholism.....	Other Causes
Suisun and vic., Dr. J. W. B. Reynolds--	4,000	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Sutter County, Dr. T. T. Perry.....	5,469	6	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5
Soquel and vicinity Dr. H. O. Brink.....	400	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Templeton and vic., Dr. O. P. Paulding.....	400	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Truckee and vicinity, Dr. W. Curless.....	1,300	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Tulace City, Dr. C. F. Taggart.....	2,000	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Vallejo and vic., Dr. W. D. Anderson.....	6,000	13	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Ventura and vic., Dr. A. J. Comstock.....	9,000	5	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
Vacaville and vicinity, Dr. J. W. Stitt.....	4,500	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
Watsonville and vic., Dr. W. D. Rodgers.....	2,500	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
Whetland and vic., Dr. Lewis Melton.....	700	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Willows and vicinity, Dr. Rooney.....	3,000	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Woodbridge, Dr. S. E. Latta.....	300	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Woodland, R. B. Mosby, H. O.....	3,069	3	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Totals	783,684	1,176	191	89	39	11	1	1	55	32	10	14	12	0	8	0	19	3	4	34	2	109	9	533

Including the following towns reporting no deaths: Anderson (pop., 1,000), Calico (pop., 1,000), College City (pop., 1,000), Downville and vicinity (pop., 1,000), Fort Bidwell and vicinity (pop., 1,500), Fresno (pop., 10,786), Fresno Flats (pop., 600), Gonzales (pop., 350), Halfmoon Bay (pop., 450), Lugo (pop., 200), Knights Ferry (pop., 250), Livermore (pop., 1,500), Lincoln (pop., 1,000), Lakeport (pop., 1,100), National City (pop., 1,200), Nicolaus (pop., 400), Needles and vicinity (pop., 760), San Rafael (pop., 3,891), Santa Maria (pop., 1,000), Sebastopol (pop., 500), Tehama (pop., 350), Upper Lake (pop., 300), Winters and vicinity (pop., 1,000), and Williams (pop., 500).

Including the following towns reporting no deaths: Anderson (pop., 1,000), Calico (pop., 500), College City (pop., 1,000), Downieville and vicinity (pop., 1,000), Fort Bidwell and vicinity (pop., 1,500), Fresno (pop., 10,796), Fresno Flats, (pop., 600), Gonzales (pop., 350), Halfmoon Bay (pop., 450), Go (pop., 200), Knights Ferry (pop., 250), Livermore (pop., 1,500), Lincoln (pop., 1,000), Lakeport (pop., 1,100), National City (pop., 1,200), Niclaus, (pop., 400), Needles and vicinity (pop., 750), San Rafael (pop., 3,891), Santa Maria (pop., 1,000), Sebastopol (pop., 500), Tehama (pop., 350), Upper Lake (pop., 300), Winters and vicinity (pop., 1,000), and Williams (pop., 500).

LOCATIONS AND AUTHORITIES.	
Aluraz, Dr. John M. Forrest.....	512
Alameda, Dr. John T. McLean.....	11,900
Anaheim and vicinity, Dr. J. H. Bullard.....	5,000
Antioch and vicinity, Dr. W. S. George.....	3,000
Auburn, Dr. A. S. Waldo.....	1,601
Azusa and vicinity, Dr. J. H. Miller.....	2,000
Bakersfield and vicinity, Dr. C. A. Rogers.....	3,700
Berkeley, Dr. F. H. Payne.....	5,500
Biggs, Dr. O. C. Hawkins.....	750
Carpenteria and vicinity, Dr. R. Cauch.....	800
Colton and vicinity, Dr. M. F. Price.....	2,000
College City, Dr. C. H. Gibbons.....	1,000
Cottonwood and vicinity, Dr. J. O. Smith.....	1,200
Cloverdale and vic., Dr. E. S. Markell.....	1,500
Chico and vicinity, Dr. William King.....	8,890
Dixon, Dr. Aug. Trafon.....	1,567
Downey and vicinity, Dr. Q. J. Rowley.....	2,500
Etna Mills and vic., Dr. E. W. Bathurst.....	1,000
El Monte and vic., Dr. R. D. Adams.....	1,650
Eureka and vicinity, Dr. S. B. Foster.....	10,000
Forest Hill and vic., Dr. Paul Reudy.....	3,000
Fresno, Dr. W. T. Maupin.....	10,796
Fresno Flats, Dr. J. N. McGowan.....	800
Folsom, John Harris, H. O.....	1,960
Galt, Dr. Alex. Montague.....	700
Grass Valley and vic., Dr. W. R. Thomas.....	7,000
Gonzales, Dr. C. A. E. Hertel.....	450
Gridley, Dr. J. T. Harris.....	700
Haywards, Dr. G. E. Alexander.....	3,800
Healdsburg and vic., Dr. N. B. Coffman.....	4,000
Hollister, Dr. J. H. Tebbetts.....	2,000
Ione and vicinity, Dr. A. L. Adams.....	1,800
Long Beach and vic., Dr. J. W. Wood.....	2,600

[illegible]

LOCATIONS AND AUTHORITIES.

Other Causes	27	21	13	11	11	10	0	1	1	1	1	432			
Alcoholism	0	0	0	0	0	0	0	1	0	0	0	9			
Heart Diseases	0	2	1	0	0	0	0	0	0	0	1	84			
Erysipelas	0	0	0	0	0	0	0	0	0	0	0	2			
Cancer	0	1	0	0	0	0	0	0	0	0	0	39			
Cerebro - Spinal Fevers	0	0	0	0	0	1	0	0	0	0	0	8			
Remittent and Intermittent Fevers	0	0	0	0	0	0	0	0	0	0	0	4			
Typhoid Fever	0	0	0	0	0	0	0	0	0	0	0	15			
Typho - Malarial Fever	0	0	0	0	0	0	0	0	0	0	0	0			
Whooping-Cough	0	0	0	0	0	0	0	0	0	0	0	11			
Smallpox	0	0	0	0	0	0	0	0	0	0	0	0			
Measles	0	0	0	0	0	0	0	0	0	0	0	9			
Scarlet Fever	0	1	0	0	0	0	0	0	0	0	0	6			
Croup	1	0	0	0	0	0	0	0	0	0	1	11			
Diphtheria	0	0	0	0	0	0	0	0	0	0	0	26			
Other Diseases of St'mach & Bow'ls	0	0	0	0	0	0	2	0	0	0	0	41			
Cholera Infantum	0	0	0	0	0	0	0	0	0	0	0	5			
Diarrhoea and Dysentery	0	0	0	0	0	0	0	0	0	0	0	9			
Congestion of the Lungs	0	0	0	0	0	0	0	0	0	0	0	10			
Acute Bronchitis	0	0	0	0	0	0	0	0	0	0	0	35			
Acute Pneumonia	0	0	0	0	0	0	0	0	1	1	0	76			
Consumption	0	3	1	0	0	0	2	0	1	1	0	195			
Total Deaths	3	14	4	1	0	3	1	4	1	3	2	1,027			
Estimated Population	2,000	14,376	2,800	4,000	5,469	3,000	1,300	2,000	9,000	4,500	2,500	789,931			
Locations and Authorities.	Sausalito and vic., Dr. G. C. Macdonald.	Stockton, Dr. C. A. Ruggles.	St. Helena and vic., Dr. W. J. G. Dawson.	Suisun and vic., Dr. J. W. B. Reynolds.	Sutter County, Dr. T. P. Perry.	North Temescal, Dr. B. T. Mouser.	Truckee and vicinity, Dr. W. Curlless.	Tulare City, Dr. C. F. Taggart.	Ventura and vic., Dr. A. J. Comstock.	Wacaville and vicinity, Dr. J. W. Stitt.	Watsonville and vic., Dr. W. D. Rodgers.	Winters and vicinity, Dr. Z. T. Magill.	Williams, Dr. A. W. Kimball.	Woodland, R. B. Mosby, H. O.	Totals

Included in the above are the following places reporting no deaths: Calico (pop., 500), Calistoga and vicinity (pop., 2,000), Cedarville (pop., 200), Downieville and vicinity (pop., 1,000), Elsinore (pop., 800), Fort Bidwell and vicinity (pop., 1,500), Igo (pop., 200), Jackson and vicinity (pop., 2,000), K. Knights Ferry (pop., 250), Lockeford (pop., 400), Lincoln (pop., 1,000), Merced (pop., 2,000), Nicolaus (pop., 100), Oakdale (pop., 1,000), Pacific Grove (pop., —), Placerville and vicinity (pop., 1,684), Roseville (pop., 450), Sebastopol (pop., 500), Sierra Valley and vicinity (pop., 1,000), Soquel and vicinity (pop., 400), Templeton and vicinity (pop., 400), Tehama (pop., 350), Upper Lake (pop., 300), Wheatland (pop., 700), and Woodbridge (pop., 300).

REPORT OF THE STATE BOARD OF HEALTH.

MAY, 1892.

Mortality reports from 110 cities, towns, villages, and sanitary districts, having an aggregate population of 804,553, show 1,056 deaths from all causes during the month of May. This corresponds to a death rate of 1.31 per 1,000 for May, or 15.72 per annum.

There were 162 deaths due to consumption, 66 to pneumonia, 41 to bronchitis, 8 to congestion of the lungs, 10 to diarrhoea and dysentery, 17 to cholera infantum, 44 to other diseases of the stomach and bowels, 29 to diphtheria, 11 to croup, 15 to scarlatina, 6 to measles, 11 to whooping-cough, 14 to typhoid fever, 5 to malarial fevers, 1 to cerebro-spinal fever, 31 to cancer, 4 to erysipelas, 95 to diseases of the heart, 6 to alcoholism, 2 to influenza, and 478 to all other causes.

In January there were 595 deaths from diseases of the lungs, in February 380, in March 330, in April 306, and in May 277.

There were 96 deaths in January from la grippe, 29 in February, 9 in March, 2 in April, and 2 in May.

PREVAILING DISEASES.

Reports of prevailing diseases from 70 towns and sanitary districts outside of the large cities, show 18 cases of acute pneumonia, 17 of pleurisy, 135 of acute bronchitis, 5 of congestion of the lungs, 154 of diarrhoea, 65 of dysentery, 25 of cholera infantum, 42 of cholera morbus, 31 of diphtheria, 6 of croup, 23 of scarlatina, 57 of measles, 83 of whooping-cough, 150 of malarial fevers, 18 of typhoid fever, 30 of erysipelas, 17 of inflammation of the brain, 17 of inflammation of the bowels, 10 of inflammation of the kidneys, 63 of influenza, 77 of neuralgia, 70 of rheumatism, and 89 of tonsillitis.

Measles is reported at Merced and Santa Clara, but is also prevalent in other places. Whooping-cough prevailed in a number of localities. Diphtheria was reported epidemic at Riverside and College City, and scarlatina at Merced.

The case of varioloid at Berkeley and the one at Sacramento have both been discharged, and although sufficient time has elapsed, no new cases have developed.

Another case was reported from San Pablo, Contra Costa County, but it has been impossible to obtain reliable data concerning the previous history of the man afflicted. The usual precautions were adopted, and the patient will soon be, if he is not already, discharged.

A case of leprosy was recently discovered in Oakland, which came not long ago from the Hawaiian Islands. The local Board of Health was disturbed concerning the disposition which should be made of the case, inasmuch as there are no accommodations for lepers in California, outside of the county pesthouses. The leper (a woman) relieved the city of her unwelcome presence, and was next found in the City and County Hospital in San Francisco. The Health Department of Oakland is naturally solicitous concerning the large family of which the leprous woman was a member, all of whom are still domiciled there, including the woman's infant, only 2 months old.

The following resolution by the Oakland Board of Health will show the helpless condition in which any city or county may find itself placed, when brought to confront an unusual sanitary problem. There is appended, also, an extract from a letter by Dr. William M. Lawlor, Quarantine Officer and United States Quarantine Inspector at San Francisco:

"OAKLAND, CAL., June 4, 1892.

"Resolved, That the Secretary notify the State Board of Health of there being a large family in Oakland, one of the members of which, a woman with leprosy, was recently taken to the pesthouse in San Francisco;

"That her child two months old, is still with the family in Oakland;

"That her child, two months old, is still with the family in O.
 "That this family recently came from the Sandwich Islands."

"That the woman had leprosy before leaving the Sandwich Islands, but was permitted to land in San Francisco, from which place they came to Oakland;

“What measures should be taken, if any, in dealing with this family?”

"Yours respectfully,

respectfully,
"PAUL J. SCHAFER,
 "Secretary of the Board of Health of the City of Oakland."

The following is an explanatory extract from a letter by Dr. William M. Lawler, Quarantine Officer at San Francisco:

Quarantine Officer at San Francisco:

"I have made inquiries as to the case of leprosy that was discovered in Oakland, and subsequently found in the City and County Hospital. From all that I can learn, the patient is afflicted with the disease in her hands and feet. I call attention to the fact that as leprosy is not a disease that comes under the head of strict quarantine regulations, such as smallpox or the other contagious diseases, that it would be an easy matter for a person afflicted, as the case under consideration, to pass my inspection without detection, and in this connection I wish to call attention to the fact that the case under discussion was in the hospital from Monday until the following Saturday without being discovered as a case of leprosy. It is the custom of this department to see and personally pass upon every soul aboard of all incoming vessels from foreign ports, and the strictest supervision is exercised to prevent the introduction of contagious diseases. We are of opinion that the above case comes strictly under the head of the United States Immigration Department, for upon the discovery of such a case the vessel would not be

detained, but the case of leprosy should be immediately returned to the port from which it came, and such action would have to be taken by the United States Immigration Inspector. Several cases have recently been discovered by this department, and reported to the Immigration Inspector, and have by him been returned. In this connection, I would respectfully suggest to the Governor the propriety of calling the attention of the authorities at Washington to the urgent necessity of having a competent medical officer connected with the United States Immigration Department, to make the examinations of all passengers coming under the Immigration Act, and by this means have a double check on all cases likely to be imported into the State. With leprosy, the most urgent and complete vigilance should be exercised to prevent its introduction, for we are menaced with this danger by the large and increasing immigration from the Hawaiian Islands of a class of immigrants in the extreme undesirable, consisting of the poorest class of Portuguese and Japanese, who have been working under contract. The resolutions passed by the Oakland Board of Health, with reference to the family, show the necessity of having a State lazaretto established, where such cases could be kept under observation. Leprosy cases are liable to be discovered and developed in any county of the State; they are liable to be introduced at any time by persons having the disease, and not having discovered it, or, having the germs in their system, it is developed at a later period. Such cases should not be thrown on San Francisco County simply because they were obliged to enter the State by the port of San Francisco."

It does not matter what legal points this case may involve. It serves merely to indicate that it must soon become the duty of the State to care for the unfortunates who may be found afflicted with this incurable and loathsome disease, within the borders of its territory, in a manner more appropriate and humane than in the county pesthouses.

Nearly every populous county in the State has more than once cared for lepers in pesthouses, but San Francisco has borne the greatest share of the burden. Those counties which have found it inconvenient to erect pesthouses, have kindly assisted the afflicted person to the metropolis, and in this way a considerable number have been cared for nearly all the time, which properly belonged in other counties. Sacramento has had a number of cases. Yolo had one or two in recent years. Fresno had one not long ago.

The State Board of Health has under consideration a bill, to be presented to the next Legislature, providing for a lazaretto in which to sequester this class of incurables, for all must agree that it is neither prudent nor proper to treat them as they are now being cared for.

Abstract of the Reports of Deaths and their Causes in California during May, 1892.

Other Causes	0	11	2	3	1	1	1	1	0	2	0	0	2	0	1	0	5	3	0	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0
Alcoholism.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Heart Diseases	0	1	0	3	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Erysipelas.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cancer	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cerebro - Spinal Fevers.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Remittent and Intermittent Fevers	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Typhoid Fever	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Typho - Malarial Fever.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Whooping-Cough.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Smallpox	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Measles.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Scarlet Fever	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Croup.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Diphtheria	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Other Diseases of St'mach & Bow'ls	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cholera Infantum.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Diarrhoea and Dysentery	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Congestion of the Lungs.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acute Bronchitis.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acute Pneumonia.....	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Consumption.....	0	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Deaths	0	17	4	6	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Estimated Population	550	12,000	5,000	1,000	1,000	1,601	2,000	5,500	750	500	2,000	800	2,000	700	1,200	1,500	3,890	1,500	1,567	1,000	2,500	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000
LOCATIONS AND AUTHORITIES.	Alturas, Dr. John M. Forrest	Alameda, Dr. John T. McLean	Anaheim and vicinity, Dr. J. H. Bullard	Antioch and vicinity, Dr. W. S. George	Anderson, Dr. L. J. Fabier	Auburn, Dr. A. S. Waldo	Azusa and vicinity, Dr. J. H. Miller	Berkeley, Dr. F. H. Payne	Biggs, Dr. O. C. Hawkins	Calico, Dr. A. R. Rhea	Callistoga, Dr. F. W. Mitchell	Carpenteria and vicinity, Dr. R. Cauch	Colton and vicinity, Dr. M. F. Price	College City, Dr. C. H. Gibbons	Cottonwood and vicinity, Dr. J. O. Smith	Cloverdale, Dr. R. S. Markell	Chico and vicinity, Dr. William King	Davisville, Dr. W. E. Bates	Dixon, Dr. Aug. Trafton	Downville and vic., Dr. Alembly Jump	Downey and vicinity, Dr. Q. J. Rowley	Etna Mills and vic. Dr. E. W. Bathurst	El Monte and vicinity, Dr. R. D. Adams	Elk Grove, Dr. J. H. McKee	Eureka and vicinity, Dr. S. B. Foster	Ft. Bidwell and vic, Dr. W. J. Wakeman	Fresno Flats, Dr. J. N. McGowan	Fresno, Dr. W. T. Maupin	Folsom, John Harris, H. O.	Galt, Dr. Alex. Montague	Grass Valley, Dr. W. E. Thomas	Gonzales and Soledad, Dr. C. A. E. Hertel	Gridley, Dr. J. T. Harris	

[illegible]

Pope Valley and vic., Dr. R. T. Rose	1,000
Point Arena, Dr. W. J. G. Dawson	500
Plaso Robles, Dr. C. C. Gleaves	1,000
Pleasanton, Dr. Wm. H. Cope	800
Red Bluff and vicinity, Dr. J. M. West.	5,000
Redlands and vicinity, Dr. J. M. Wheat.	3,600
Riverside, Dr. W. B. Sawyer, H. O.	4,780
Rio Vista and vicinity, Dr. B. Dozier	1,800
Rocklin, Dr. R. H. Ashby	1,020
Sacramento, Dr. H. L. Nichols	29,272
San Bernardino Co., Dr. C. C. Wainwright	30,000
San Diego, Dr. Thomas L. Magee	16,153
San Francisco, Dr. J. W. Keeney	390,000
San José, Dr. J. R. Curnow	18,027
San Luis Obispo, County Recorder	3,000
San Mateo and vic., Dr. J. K. Goodspeed	2,900
San Rafael, Dr. W. J. Wickman	3,891
Santa Barbara, Dr. F. M. Casal	5,864
Santa Clara, Dr. George W. Seifert	2,887
Santa Cruz and vic., Dr. B. A. Plant	10,000
Santa Rosa, Dr. R. P. Smith	5,216
Santa Paula and vic., Dr. D. W. Mott	2,000
Santa Maria, Dr. M. Thornburg	1,000
Sausalito, Dr. G. C. Macdonald	1,200
Sutter County, Dr. T. P. Perry	5,469
Sebastopol, Dr. J. G. Pierce	300
Sierra Valley and vic., Dr. M. Pritchard	1,000
Sisson, Dr. G. H. Fleet	400
Stockton, Dr. C. A. Ruggles	14,376
St. Helena and vic., Dr. W. J. G. Dawson	2,800
Templeton, Dr. O. P. Paulding	400
Truckee and vic., Dr. W. Curless	1,300
Tulare City and vic., Dr. C. F. Taggart	4,000
Upper Lake, Dr. R. G. Reynolds	300
Vallejo, Dr. W. D. Anderson	6,000
Ventura and vic., Dr. A. J. Cornstock	9,000
Vacaville and vicinity, Dr. J. W. Stitt	4,500
Watsonville and vic., Dr. W. D. Rodgers	2,500
Winters and vicinity, Dr. Z. T. Magill	1,000
Williams, Dr. A. W. Kimball	500
Woodland, R. B. Mosby, H. O.	3,069
Totals	*\$84,303

* Including towns of 1,000 population in which no deaths occurred.

JUNE, 1892.

Mortality reports from 109 cities, towns, villages, and sanitary districts, having an aggregate population of 788,073, show 121 deaths from all causes during June. This corresponds to a death rate of 1.29 per 1,000, or 15.48 per annum.

There were 136 deaths due to consumption, 58 to pneumonia, 24 to bronchitis, 5 to congestion of the lungs, 17 to diarrhoea and dysentery, 33 to cholera infantum, 63 to other diseases of the stomach and bowels, 22 to diphtheria, 7 to croup, 14 to scarlatina, 7 to measles, 5 to whooping-cough, 14 to typhoid fever, 3 to malarial fevers, 8 to cerebro-spinal fever, 1 to erysipelas, 34 to cancer, 89 to diseases of the heart, 6 to alcoholism, and 475 to other causes.

No deaths from la grippe were reported in June.

PREVAILING DISEASES.

Reports of prevailing diseases from 70 towns and sanitary districts outside of the large cities, show 23 cases of pneumonia, 77 of bronchitis, 6 of pleuritis, 6 of congestion of the lungs, 200 of diarrhoea, 57 of dysentery, 53 of cholera morbus, 32 of cholera infantum, 77 of inflammation of the bowels, 20 of diphtheria, 32 of scarlatina, 31 of measles, 15 of whooping-cough, 43 of la grippe, 24 of typhoid fever, 118 of malarial fevers, 6 of cerebro-spinal fever, 13 of erysipelas, 69 of rheumatism, 63 of neuralgia, and 72 of tonsillitis.

June was comparatively a healthy month. The death rate per 1,000 was 1.29, against 1.47 in 1891. There is shown an increase of diseases of the stomach and bowels, but that is expected in summer, when the fruit ripens. Cholera infantum is more frequently fatal during the warm weather.

Those diseases which increased the mortality reports of the winter continue to abate. Smallpox is not reported at all. It is, however, reported epidemic at Victoria, B. C., and although Oregon and Washington lie between us and that point, it may very soon be necessary to place an Inspector at the northern boundary of the State to detain any persons showing symptoms of the disease.

Cholera, true to tradition, is following upon the heels of la grippe. It has leaped all boundaries between Asia and Europe, and is reported as devastating the famine-stricken districts of Russia. But with the rapid and easy methods of travel, cholera no longer moves at a man's pace. Like a winged messenger, it has arrived in the great capitals of Europe, and consultations are being held to decide what best may be done to stay its fatal spread. Common prudence would dictate that we look after our private and municipal sanitary affairs. It is just as well to expect no benefits from quarantine in cholera. It has never alone checked the progress of this disease. Cholera has always mocked at quarantine, but it has been repeatedly balked by want of filth and polluted soil to breed in and spread from. It is the duty of medical men to explain to the public that cholera is not contracted, like smallpox, measles, and scarlatina, but from swallowing the germs in water and food, or, after they have effected a lodgment in the throat, from a vitiated and poisoned atmosphere. We may not be visited at all, but the specter will be shorn of half its terrors when we have done all there is to be accomplished to hold it back.

Abstract of the Reports of Deaths and their Causes in California during June, 1892.

Other Causes	0	0	8	1	3	1	1	1	3	0	0	0	7	1	1	2	1	0	5	0	0	1	3	0	1	0	2	5	1				
Alcoholism.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
Heart Diseases	0	0	2	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0				
Erysipelas.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
Cancer	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
Cerebro - Spinal Fevers.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0				
Remittent and Intermittent Fevers.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
Typhoid Fever	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0				
Typho - Malarial Fever.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
Whooping-Cough..	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
Smallpox.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
Measles.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
Scarlet Fever	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0				
Croup	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
Diphtheria.....	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0				
Other Diseases of St'mach & Bow'ls	0	0	2	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
Cholera Infantum.	0	0	1	0	0	0	0	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0				
Diarrhoea and Dysentery.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
Congestion of the Lungs.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
Acute Bronchitis..	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
Acute Pneumonia..	0	0	2	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0				
Consumption.....	0	0	9	1	0	0	0	1	1	0	0	0	2	1	0	0	0	0	2	1	0	0	0	0	0	1	0	0	0				
Total Deaths	0	0	18	2	5	3	1	4	7	1	0	2	9	1	2	2	0	9	0	0	0	2	5	0	1	4	7	4	4				
Estimated Popula- tion	600	550	12,300	5,000	3,000	1,000	1,601	2,000	5,500	500	2,000	800	2,000	700	1,200	1,500	3,890	1,500	2,000	1,000	1,650	200	10,000	800	1,500	600	12,000	1,960	700	500	700	3,800	4,000
LOCATIONS AND AUTHORITIES.	Alvarado, Dr. Albert Fouch.....	Alturas, Dr. John M. Forrest.....	Alameda, Dr. John T. McLean.....	Anaheim, Dr. J. H. Bullard.....	Antioch and vicinity, Dr. W. S. George.....	Anderson, Dr. J. T. Harris.....	Auburn, Dr. A. S. Waldo.....	Azusa and vicinity, Dr. J. H. Miller.....	Berkeley, Dr. F. M. Payne.....	Calico, Dr. A. R. Rhea.....	Calistoga, Dr. F. W. Mitchell.....	Carpenteria, Dr. R. Cauch.....	Colton and vicinity, Dr. M. F. Price.....	College City, Dr. C. H. Gibbons.....	Clovenwood and vic., Dr. J. O. Smith.....	Cloverdale, Dr. R. S. Markell.....	Chico and vicinity, Dr. William King.....	Davisville, Dr. W. E. Bates.....	Dixon, Dr. Aug. Trafton.....	Downieville and vic., Dr. Alembry Jump.....	El Monte and vicinity, Dr. R. D. Adams.....	Elk Grove, Dr. J. H. McKee.....	Eureka and vicinity, Dr. S. B. Foster.....	Elsmore, Dr. Thomas B. Ellis.....	Fort Bidwell and vic., Dr. Geo. Kober.....	Fresno Plains, Dr. J. N. McGowan.....	Fresno, Dr. W. T. Maupin.....	Folsom, John Harris, H. O.....	Galt, Dr. Alex. Montague.....	Gonzales, Dr. C. A. E. Hertel.....	Gridley, Dr. J. T. Harris.....	Haywards, Dr. G. E. Alexander.....	Healdsburg and vic., Dr. N. B. Coffman.....

[illegible][illegible]

*Sierra Valley and vicinity, population 1,000, no deaths.

FINANCIAL STATEMENT.

STATEMENT OF THE EXPENSES OF THE STATE BOARD OF HEALTH FOR THE FORTY-SECOND FISCAL YEAR, ENDING JUNE 30, 1891.

Appropriation March 21, 1889.....	\$1,500 00
Balance from forty-first fiscal year.....	303 14
1890.	
July—Expressage.....	\$1 90
Traveling expenses.....	25 00
Traveling expenses, C. A. Ruggles.....	14 50
Traveling expenses, J. M. Briceland.....	29 40
Traveling expenses, H. S. Orme.....	50 00
Postage stamps.....	20 00
Telegrams.....	1 85
Typewriter.....	100 00
Office rent.....	25 00
Aug.—Expressage.....	55
Telegraphing.....	95
Traveling expenses.....	20 00
Postage stamps.....	15 00
Stationery.....	2 55
Wood engraving for report.....	20 00
Office rent.....	25 00
Sept.—Carpet sweeper for office.....	3 50
Duster.....	50
Postage stamps.....	15 50
Stationery.....	9 10
Telegraphing.....	2 10
Post Office box rent.....	2 00
Subscription "Annual of Hygiene".....	14 50
Office rent.....	25 00
Oct.—Typewriter cabinet.....	13 30
S. S. Herrick, compiling laws.....	75 00
Expressage.....	40
Traveling expenses, Secretary.....	32 50
Traveling expenses, J. M. Briceland.....	40 50
Traveling expenses, C. A. Ruggles.....	51 90
Traveling expenses, H. S. Orme.....	67 75
Office rent.....	25 00
Telegraphing.....	9 39
Nov.—Stamps.....	10 00
Hopkins.....	1 00
Stamps.....	22 00
Wrappers.....	5 00
Expressage on Biennial Report.....	40 95
Freight on Biennial Report.....	1 00
Expressage on Biennial Report.....	12 80
Stamps.....	47 00
Telegraphing.....	40
Stationery.....	2 95
Office rent.....	25 00
Crocker & Co.....	8 00
Stamps.....	23 00
Traveling expenses.....	15 00
Expressage.....	1 75
Stamps.....	12 00
Traveling expenses.....	15 00
H. S. Crocker & Co., envelopes.....	13 30
Traveling expenses.....	15 00
Traveling expenses, C. A. Ruggles.....	17 00
Telegraphing.....	2 15
Post Office box rent.....	2 00
Office rent.....	25 00

1891.		
Jan.—C. S. Houghton.....	40	
H. S. Crocker, stationery.....	3 15	
Stamps.....	4 00	
"Sanitary News".....	2 00	
Traveling expenses, C. A. Ruggles.....	12 90	
Traveling expenses, J. M. Briceland.....	27 00	
Traveling expenses, H. S. Orme.....	47 00	
"Sanitary Record".....	3 02	
"Sanitarian".....	4 00	
Stamps.....	15 00	
Expressage.....	1 15	
Telegraphing.....	75	
Office rent.....	25 00	
Feb.—Telegraphing.....	54	
Office rent.....	25 00	
March—A. P. H. Association, subscription.....	5 00	
Postage.....	10 00	
Expressage.....	3 80	
Engraving stamps.....	2 50	
Traveling expenses, C. A. Ruggles.....	9 15	
Post Office box rent.....	2 00	
Telegrams.....	3 00	
Postal cards.....	10 00	
Office rent.....	25 00	
April—Postal cards.....	5 00	
Stationery.....	3 55	
Traveling expenses, J. M. Briceland.....	27 50	
Traveling expenses, C. A. Ruggles.....	12 40	
Traveling expenses, R. B. Cole.....	15 00	
Traveling expenses, H. S. Orme.....	51 75	
Office rent.....	25 00	
Traveling expenses, C. A. Ruggles.....	3 50	
Traveling expenses, C. W. Nutting.....	48 10	
Traveling expenses, W. G. Cochran.....	54 00	
Traveling expenses, P. C. Remondino.....	65 00	
May—N. Eldred, hauling furniture, etc.....	5 00	
H. Williams, packing books.....	2 50	
Postage stamps.....	14 00	
Official census.....	2 50	
Expressage.....	85	
Office rent.....	25 00	
June—Postage stamps.....	5 00	
Postage stamps.....	15 00	
Expressage.....	3 70	
Office rent.....	25 00	
Three book cases.....	26 00	
Total.....	\$1,733 65	
Balance.....	69 49	
Total.....	\$1,803 14	\$1,803 14

STATEMENT OF THE EXPENSES OF THE STATE BOARD OF HEALTH FOR THE FORTY-THIRD FISCAL YEAR, ENDING JUNE 30, 1892.

Appropriation April 6, 1891.....	\$1,500 00
July—Traveling expenses of C. A. Ruggles.....	\$14 40
Traveling expenses of W. G. Cochran.....	50 50
Office rent.....	25 00
Overhauling books.....	2 50
Stationery, etc.....	3 25
Postage stamps.....	15 00
Expressage.....	2 85
August—Office rent.....	25 00
Postage stamps.....	10 00
Expressage.....	2 25
Telegraphing.....	1 65
Western Union Telegraph Co.....	5 43
Sept.—Office rent.....	25 00
Stamps.....	10 00
Expressage.....	50
Traveling expenses, J. R. Laine.....	10 60

October—	Traveling expenses, W. G. Cochran.....	91 60	
	Traveling expenses, C. W. Nutting.....	88 45	
	Traveling expenses, C. A. Ruggles.....	55 05	
	Traveling expenses, J. R. Laine.....	46 85	
	Office rent.....	25 00	
	Postage stamps.....	10 00	
	Postal cards.....	10 00	
	Expressage.....	1 20	
	For typewriting.....	5 00	
Nov.—	Office rent.....	25 00	
	Postage.....	40 00	
	Expressage.....	40	
	Telegrams.....	1 64	
	Glazing.....	75	
	Stationery.....	3 50	
Dec.—	Office rent.....	25 00	
	Postage.....	20 00	
	Expressage.....	50	
1892.			
Jan.—	Expressage.....	1 05	
	Traveling expenses, W. G. Cochran.....	50 50	
	Traveling expenses, C. A. Ruggles.....	14 40	
	Stamps.....	20 00	
	Office rent.....	25 00	
Feb.—	Office rent.....	25 00	
	Postage.....	25 00	
	Subscription "Sanitarian".....	4 05	
	Subscription "Sanitary Record".....	2 60	
	Telegrams.....	35	
	Expressage.....	1 75	
March—	Office rent.....	25 00	
	Postage.....	25 00	
	Expressage.....	50	
April—	Office rent.....	25 00	
	Postage.....	40 00	
	Expressage.....	30	
	Telegraphing.....	40	
	Traveling expenses, C. A. Ruggles.....	33 90	
	Traveling expenses, P. C. Remondino.....	70 00	
	Traveling expenses, W. G. Cochran.....	55 50	
	Traveling expenses, C. W. Nutting.....	53 40	
	Traveling expenses, J. R. Laine.....	24 00	
May—	Traveling expenses, J. R. Laine.....	44 45	
	Traveling expenses, W. G. Cochran.....	5 45	
	Traveling expenses, P. C. Remondino.....	28 00	
	Traveling expenses, C. A. Ruggles.....	70 20	
	Office rent for May.....	25 00	
	Postage.....	40 00	
	Postal cards.....	45 00	
June—	Office rent.....	25 00	
	Postage stamps.....	10 00	
	Statutes, 1891.....	2 50	
	H. S. Crocker, Codes and scales.....	19 00	
	Total.....	\$1,491 17	
	Balance.....	8 83	
	Total.....	\$1,500 00	\$1,500 00

EXPENSES OF THE STATE BOARD OF HEALTH ON ACCOUNT OF CONTAGIOUS AND INFECTIOUS DISEASES FOR THE FORTY-SECOND AND FORTY-THIRD FISCAL YEARS.

1890.			
July 1—	Unexpended balance in appropriation.....	\$5,982 45	
1892.			
April 12—	Traveling expenses, P. C. Remondino.....	\$250 00	
	Balance.....	5,732 45	
	Total.....	\$5,982 45	\$5,982 45

Cholera
Cholera
Diarrhoea
Smallpox
Measles
Scarlatina
Diphtheria
Croup
Influenza
Whooping
Erysipelas
Fevers—

Syphilis
Alcohol
Hydrocephalus
Tuberculosis
Phthisis
Marasmus
Scrofula
Rheumatism
Cancer
Pneumonia
Pleurisy
Bronchitis
Other diseases
Enteritis
Gastritis
Gastroenteritis
Peritonitis
Disease
Other diseases
Bright's
Aneurysm
Heart disease
Convulsions
Other diseases
Puerperal
Old age
Suicide
Heat, diseases
All other
Stillbirths

Total

* M

who has died of typhoid fever is extremely dangerous.

TABLE No. 1.

Number of Deaths from all Causes, with the Sexes, Months, Ages, and Nativities of those Dying in California, from June 30, 1890, to June 30, 1891.

CAUSES OF DEATH.	SEXES.				MONTHS.												AGES.										NATIVITIES.			
	Total	Male	Female	Unclassified	July	August	September	October	November	December	January	February	March	April	May	June	Under 1 year	1 to 5 years	5 to 10 years	10 to 20 years	20 to 30 years	30 to 40 years	40 to 50 years	50 to 60 years	60 to 100 years	Unclassified	Pacific States	Atlantic States	Foreign	Unclassified
ra morbus	14	6	6	2	2	7	4	1	1	3	0	0	0	0	1	3	4	2	1	2	2	0	0	0	2	7	9	1	3	3
ra infantum	326	116	117	93	78	74	43	31	29	11	5	5	0	15	36	277	38	38	3	0	0	0	0	0	2	4	289	1	3	3
heea and dysentery	173	82	68	23	30	20	24	15	16	9	4	3	0	21	23	71	37	3	5	4	3	3	20	5	21	4	121	18	1	25
pox	4	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	1	2	1	0
ea	26	16	12	1	2	2	1	1	0	1	1	1	0	8	5	8	12	1	1	2	0	0	0	0	0	0	1	23	2	1
etina	29	16	12	1	2	2	1	1	5	2	2	2	0	1	9	61	13	14	10	3	0	0	0	0	0	0	0	24	4	0
heria	488	225	238	15	16	24	20	39	58	64	67	60	0	56	23	61	13	215	182	50	8	2	2	1	2	13	408	55	20	0
enza	218	126	90	2	7	4	10	19	38	35	22	28	0	23	20	35	127	47	7	0	2	0	0	0	0	0	189	9	17	9
ping-cough	50	25	22	3	0	0	0	0	2	2	1	2	0	17	13	7	5	4	2	2	4	6	4	21	1	1	13	25	2	3
elas	35	15	19	1	0	2	2	1	2	1	2	1	0	3	4	17	25	8	1	0	0	0	0	0	0	1	29	2	3	3
s-Typho-malarial	37	25	11	1	0	0	3	2	3	5	9	7	0	3	4	4	5	0	1	2	2	1	12	6	7	1	11	12	14	7
Typhoid	17	11	3	3	0	1	0	0	1	3	0	4	0	1	7	0	0	3	0	5	1	0	3	0	0	0	3	3	7	7
Remittent and intermittent	287	185	97	5	29	23	30	39	37	31	20	9	0	15	27	27	2	14	17	32	67	56	38	23	19	19	80	81	118	6
Cerebro-spinal	57	32	23	2	10	7	6	8	6	7	6	0	0	3	4	0	6	7	4	7	7	5	3	9	2	2	53	16	6	6
lis	73	47	21	5	12	3	5	5	4	12	6	3	0	10	5	8	24	16	7	6	6	0	4	2	2	6	51	15	4	13
olism	22	14	8	0	3	2	1	2	1	2	2	3	0	1	3	3	4	0	0	1	4	7	7	4	2	0	6	6	3	13
ocephalus	121	103	16	2	10	9	10	16	0	19	15	8	0	12	4	18	0	0	0	8	21	20	41	19	12	14	29	48	3	48
ecular meningitis	24	9	15	0	3	1	4	3	1	4	1	4	1	2	1	3	11	4	3	1	1	0	2	1	0	18	3	3	3	3
is pulmonalis	154	73	53	8	3	10	22	16	3	20	25	14	0	11	4	6	68	30	7	7	9	3	5	0	3	2	100	16	17	17
mus	1,818	1,149	613	56	143	148	133	154	156	170	197	171	0	189	190	167	358	12	17	114	417	442	340	197	170	88	525	808	40	40
ala	428	232	196	0	65	56	46	57	38	47	36	29	0	39	9	6	12	1	5	5	5	14	26	1	362	25	4	1	1	1
matism	6	5	1	0	1	1	0	0	0	1	1	1	0	0	0	1	0	0	2	0	1	0	0	0	0	0	4	1	1	1
r	53	21	30	2	2	1	3	2	4	13	1	4	0	13	4	6	1	2	3	6	3	7	8	18	2	12	12	26	2	26
monia	373	181	201	11	30	37	23	29	39	36	32	31	0	39	32	45	0	1	2	3	17	43	72	78	130	27	33	131	203	0
ay	1,135	661	413	61	46	38	53	59	110	141	147	164	0	189	122	66	140	113	33	37	94	113	121	146	248	90	378	266	449	4
hitis	29	20	9	0	0	1	2	0	2	3	4	9	0	1	3	4	1	2	0	1	2	3	5	9	1	11	9	9	9	9
diseases of respiratory organs	323	201	115	7	21	25	15	19	26	28	41	47	0	43	25	33	107	42	7	4	9	16	37	33	54	14	119	40	114	14
itis	187	114	58	15	24	30	18	11	25	10	16	18	0	12	13	10	30	20	6	7	8	26	9	32	40	9	72	37	69	6
itis	169	87	81	1	22	16	12	16	12	6	14	15	0	15	26	15	110	23	2	5	6	8	6	4	2	128	9	26	28	2
o-enteritis	80	50	35	0	7	14	7	6	6	11	2	9	0	6	5	7	27	3	2	3	4	7	14	10	3	53	18	28	9	7
onitis (non-puerperal)	67	34	30	3	7	6	6	11	6	7	5	3	0	1	11	4	26	15	1	3	1	4	3	5	7	2	46	9	50	0
ses of the liver	145	50	94	1	8	7	10	11	10	13	17	13	0	21	21	14	8	3	6	7	32	30	25	12	22	0	48	44	50	7
diseases of stomach and bowels	134	93	41	0	9	6	12	18	16	16	12	9	0	9	10	17	2	1	2	1	11	21	29	29	36	2	21	38	43	3
t's disease and nephritis	150	87	62	1	15	12	10	8	15	16	15	8	0	22	20	9	23	10	5	6	20	11	20	16	31	3	52	39	53	5
riam	289	216	72	1	23	24	19	21	17	35	43	24	0	32	26	25	2	3	0	13	22	28	60	57	101	3	38	79	163	12
diseases	19	12	6	1	1	1	1	1	4	2	1	1	0	1	4	2	0	0	0	2	1	9	4	3	0	0	1	6	12	0
alsions	923	359	331	233	70	59	70	87	74	86	104	95	0	82	102	94	27	7	13	39	67	82	130	182	346	30	135	304	447	7
diseases of brain and nervous system	257	142	108	17	19	27	19	14	16	25	23	27	0	34	26	27	169	50	7	3	5	3	1	5	7	7	232	14	7	7
eral diseases	425	256	166	13	68	22	13	25	47	28	25	37	0	50	28	82	53	48	21	18	21	41	54	49	117	3	138	124	140	140
ge	82	0	82	0	5	9	9	2	9	8	8	8	0	12	0	12	0	0	0	0	29	30	6	2	1	14	23	24	31	31
le	278	143	123	12	17	13	24	17	20	28	24	12	0	44	40	39	0	0	0	0	0	0	0	0	0	275	3	29	92	140
death from (sunstroke)	132	111	17	4	17	10	7	12	12	15	12	7	0	13	12	15	0	1	1	7	27	26	28	20	18	4	22	43	57	4
her causes not classified	5	4	1	0	2	0	0	0	0	0	0	0	0	0	2	1	0	0	0	0	1	1	1	1	2	0	1	0	4	4
Births	2,851	1,686	915	250	215	215	213	244	242	317	314	364	0	60	29	238	387	143	112	148	270	284	332	289	594	292	904	735	987	2
als	12,820	7,023	4,614	1,183	1,060	976	919	1,069	1,158	1,309	1,301	1,325	0	1,354	1,154	1,195	2,045	1,055	1,533	553	1,200	1,337	1,426	1,298	2,382	689	4,681	2,926	4,222	6

March excepted.

TABLE No. 2.

Number of Deaths from all Causes, with the Sexes, Months, Ages, and Nativities of those Dying in California, from June 30, 1891, to June 30, 1892.

CAUSES OF DEATH.	SEXES.				MONTHS.												AGES.										NATIVITIES.		
	Total	Male	Female	Unascertained	July	August	September	October	November	December	January	February	March	April	May	June	Under 1 year	1 to 5 years	5 to 10 years	10 to 20 years	20 to 30 years	30 to 40 years	40 to 50 years	50 to 60 years	60 to 100 years	Unascertained	Pacific States	Atlantic States	Foreign
Acute morbus	30	20	7	3	6	6	3	6	2	0	2	0	1	0	1	3	11	4	2	1	0	1	4	4	3	0	15	4	8
Acute infantum	295	149	109	37	75	64	21	42	13	11	7	3	3	5	22	29	211	52	5	1	0	0	0	0	22	268	4	3	
Cholera and dysentery	173	82	63	28	7	8	8	7	5	20	30	20	15	30	10	13	97	21	2	1	2	0	0	0	13	123	23	24	
Erysipelas	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Scarlet fever	84	45	30	9	9	3	0	9	3	4	5	14	14	8	7	8	37	37	9	0	1	0	0	0	0	69	8	1	
Diphtheria	103	45	46	12	5	2	0	5	6	15	15	14	14	6	15	14	10	41	24	18	2	0	0	0	9	83	6	5	
Throat	484	219	197	68	51	40	43	49	34	65	39	42	37	28	35	21	37	169	147	65	15	10	3	0	1	37	346	63	30
Scarlet fever	185	90	79	16	12	9	15	21	41	15	16	16	10	13	11	6	27	103	33	5	3	1	0	0	0	13	151	13	6
Scarlet fever	223	109	102	12	5	2	3	2	4	51	107	27	13	5	3	1	18	12	3	6	9	14	18	38	96	9	36	68	80
Whooping-cough	94	39	43	12	5	9	9	3	6	5	7	7	10	14	14	5	57	24	6	1	0	0	0	4	1	1	76	4	2
Erysipelas	37	19	13	5	1	4	1	4	1	3	11	3	2	3	3	1	3	0	1	2	1	2	3	6	12	7	6	11	14
Scarlet fever	22	12	7	3	0	4	7	7	5	0	0	0	0	0	0	0	1	0	0	4	9	3	1	2	2	0	8	7	7
Typhoid	340	193	115	32	46	48	32	33	38	43	28	17	15	16	11	13	11	16	27	75	73	53	35	22	26	2	126	80	120
Remittent and intermittent	82	88	23	21	9	13	10	13	8	8	2	0	3	5	7	4	6	4	5	5	12	6	7	11	13	13	30	21	24
Cerebro-spinal	74	41	25	8	12	6	8	6	2	7	11	6	3	7	4	2	16	25	4	2	8	6	3	4	3	3	44	11	14
Scarlet fever	29	21	8	0	8	3	1	4	1	1	2	4	4	1	0	0	9	1	0	0	5	3	5	3	3	0	11	11	6
Scarlet fever	142	83	23	36	16	12	16	13	13	20	16	10	7	9	3	7	0	0	1	0	13	25	30	33	26	14	11	51	68
Scarlet fever	24	11	10	3	5	3	1	3	3	2	1	0	1	0	2	3	11	7	1	0	0	0	1	0	4	4	17	0	1
Scarlet fever	76	31	34	11	0	6	8	10	0	6	8	9	5	9	9	7	18	33	20	24	2	4	1	1	5	55	11	7	
Scarlet fever	2,304	1,320	779	205	193	161	166	192	193	228	232	198	221	212	180	138	20	24	20	176	582	523	368	229	218	144	529	707	910
Scarlet fever	506	268	229	9	10	41	48	49	46	1	48	46	47	59	60	41	426	19	0	3	2	3	8	10	27	8	442	20	34
Scarlet fever	11	8	3	0	2	0	0	3	0	0	2	1	0	1	0	2	2	0	1	1	1	2	1	0	1	1	7	4	0
Scarlet fever	51	30	17	4	3	8	3	2	2	4	7	5	6	5	4	2	3	2	4	6	4	9	3	8	10	2	22	10	16
Scarlet fever	458	194	225	39	52	40	24	46	29	48	30	38	41	29	35	4	0	0	2	15	41	94	115	169	18	34	148	246	
Scarlet fever	1,415	733	607	25	52	60	43	80	94	315	328	126	98	80	84	55	161	187	33	32	91	130	153	168	400	60	482	335	536
Scarlet fever	24	7	13	4	4	0	1	5	1	1	7	2	0	0	0	3	1	0	0	1	1	1	9	4	7	0	5	10	8
Scarlet fever	461	239	189	33	12	21	14	23	38	90	81	54	41	38	27	22	123	67	9	7	11	14	45	53	120	12	203	61	179
Scarlet fever	139	73	53	13	9	15	7	5	11	28	14	11	12	8	13	6	21	12	7	5	9	20	13	20	26	6	58	24	44
Scarlet fever	164	89	61	14	12	6	24	10	7	25	14	17	13	9	20	7	33	9	5	6	9	14	25	27	35	1	38	43	73
Scarlet fever	181	97	76	8	23	16	23	24	8	9	6	12	19	7	17	17	112	18	2	2	4	6	6	6	15	10	131	13	20
Scarlet fever	113	49	61	3	15	11	10	11	7	13	10	7	10	7	4	8	21	12	6	2	15	3	6	16	26	6	34	27	42
Scarlet fever	90	43	39	8	12	7	12	12	7	2	2	4	23	2	7	0	39	14	3	2	7	8	5	4	5	3	60	8	20
Scarlet fever	18	6	11	1	2	5	2	4	1	0	0	0	1	1	2	0	13	3	0	0	0	0	0	0	1	1	16	0	2
Scarlet fever	189	74	91	4	12	11	20	18	8	15	11	10	11	13	24	16	24	5	4	17	32	30	19	18	16	4	60	37	61
Scarlet fever	277	180	89	8	20	24	19	29	16	15	23	16	33	22	39	21	9	0	2	5	15	53	63	52	75	8	51	88	153
Scarlet fever	172	86	72	14	20	30	18	16	17	9	13	11	4	7	14	13	42	13	5	7	14	22	14	19	29	7	78	26	57
Scarlet fever	436	274	133	29	34	35	25	35	38	41	40	44	30	44	33	37	6	4	8	12	38	58	86	68	143	16	73	119	199
Scarlet fever	67	52	14	1	3	3	7	9	0	1	7	23	8	2	3	1	16	2	0	0	1	8	12	13	13	2	16	14	35
Scarlet fever	1,162	685	372	105	105	97	76	84	92	113	114	90	114	86	102	89	27	10	15	31	81	115	170	233	433	47	189	402	525
Scarlet fever	271	139	125	7	33	29	15	18	18	28	25	7	20	28	29	21	182	39	16	5	6	2	8	0	7	6	214	14	31
Scarlet fever	1,065	593	378	94	73	100	87	89	76	100	104	65	105	72	78	116	100	109	28	30	49	74	121	174	337	45	277	300	420
Scarlet fever	83	6	76	1	7	7	6	6	8	7	8	6	4	8	13	3	0	0	0	0	0	7	30	7	1	3	19	121	259
Scarlet fever	426	189	216	21	33	23	16	35	27	61	81	41	39	29	22	19	0	0	0	0	0	0	0	3	411	12	19	121	259
Scarlet fever	221	178	30	13	19	17	25	33	10	18	4	16	21	14	22	22	0	0	1	9	47	45	54	33	25	7	41	45	112
Scarlet fever	11	8	1	2	8	1	0	0	0	0	0	0	0	0	1	1	0	0	1	1	1	0	1	4	2	1	2	0	5
Scarlet fever	2,447	1,273	695	479	265	204	210	214	204	263	234	190	212	152	150	149	389	138	68	109	229	267	263	197	463	324	891	536	753
Scarlet fever	608	308	208	92	49	65	54	22	47	68	46	59	44	50	50	54	389	138	68	109	229	267	263	197	463	324	891	536	753
Births	15,847	8,690	5,589	2,068	1,854	1,278	1,131	1,310	1,207	1,751	1,816	1,284	1,331	1,156	1,184	1,035	2,354	1,338	512	666	1,457	1,611	1,674	1,615	3,212	900	5,477	3,526	5,171

RULES AND PRECAUTIONS TO BE OBSERVED BY ALL WHO COME IN CONTACT WITH DIPHTHERIA.

1. Whenever diphtheria is known to be in the neighborhood, all children with sore throats should be kept apart from other children until a competent physician has determined that the sore throat is not diphtheria.

2. A person with diphtheria should be placed in a room in the upper story of the house, if convenient, as remote as possible from direct communication with others, and access should be denied to all but the necessary attendants. All superfluous furniture, including carpets, curtains, clothing, and books, should be removed from the apartment. There should be free ventilation without drafts.

3. A card with DIPHTHERIA printed in large type should be placed in a conspicuous position on the house, and no child should be allowed to enter.

4. No food or drink that has been exposed to the atmosphere of the sick-room should be used by well persons, and the dishes used in the sick-room should be washed separately.

5. Neither the bedclothes nor the patient's body linen should be mixed with other soiled clothes or admitted to the general wash until they are first disinfected.

6. No person recently recovered from diphtheria should attend school, church, or other public assemblies, until declared by a competent physician to be no longer capable of transmitting the contagion.

7. Under no circumstances should a public funeral be held of a person dead of diphtheria. Neither must children be permitted to attend. Upon this point health officials cannot be too firm and unyielding. All personal considerations and sentiment must be subordinated to considerations of public safety.

The importance of this course should be explained by the medical profession to clergymen of all denominations, and their influence and coöperation earnestly solicited, in order that the objections and prejudices of the careless and uninformed may be more easily overcome.

DISINFECTION:

As the discharges from the nose and throat are highly contagious, they should be received on cloths, which should be immediately burned. The urine, vomited matter, and discharges from the bowels should be received in a vessel containing a solution of chloride of lime in the proportion of six or eight or more tablespoonfuls in a gallon of soft water. They should be allowed to remain in this solution at least fifteen minutes before being deposited in a privy vault or water-closet.

DISINFECTION OF CLOTHING AND PREMISES.

The soiled linen, clothing, and towels should, if possible, be boiled in hot water for thirty minutes before leaving the room; but if this be inconvenient, a solution of sulphate of zinc (white vitriol) should be made by dissolving half a pound of the zinc with six tablespoonfuls of common table salt in a gallon of water, in which the clothes should be soaked two hours before being washed.

Some physicians may recommend solutions of sulphate of iron (green copperas) instead of a solution of chloride of lime, and a solution of corrosive sublimate or carbolic acid instead of sulphate of zinc.

It has been demonstrated, however, that copperas is not properly a *disinfectant*. It is an excellent antiseptic, arresting putrefactive decomposition, but it does not destroy the vitality of disease germs or the infecting power of materials containing them.

Corrosive sublimate solutions are poisonous, and when used should be kept in earthen, glass, or wooden vessels, and should invariably be labeled POISON.

Carbolic acid is also poisonous, and, like chloride of lime, is sometimes objectionable on account of its odor.

The chloride of lime solution for the secretions and dejections of the body, and the zinc solution for the clothes and linen, will, perhaps, be the most economical and easily obtained for general use, and will prove sufficient and satisfactory. The use of any of these agents must be determined by the attending physician.

The attendants should observe scrupulous cleanliness of hands and clothing. They should not appear in public until after having first changed their clothes and otherwise removed all possibility of carrying the contagion.

In case of death, let the body be wrapped in a sheet which has been soaked in the zinc solution, and incased in a tight coffin. The interment should be private, and in no case should the remains be exposed to view.

The room which has been occupied by the sick should, after death or recovery, be effectively disinfected.

Articles which cannot be washed or boiled should be exposed to dry heat at a temperature of 230° Fahrenheit for three or four hours, the articles being freely exposed and not folded or piled up. Otherwise, the room and its contents must be fumigated by the fumes of burning sulphur.

FUMIGATION WITH SULPHUR is performed by first closing doors and windows and all apertures through which the gas might escape. Then the floors, walls, and furniture must be thoroughly dampened. For a room ten feet square, three pounds of sulphur, in fragments, are placed in an iron pan supported by bricks placed in a tub containing a few inches of water. The sulphur is then moistened with alcohol and set on fire. When well ignited, shut the door and keep the room tightly closed several hours. When sufficiently fumigated, open the room freely to the air until thoroughly ventilated, when it will again be fit for occupancy.

In addition to these precautions the cellars, privies, water-closets, cess-pools, drains, sewers, and all other probable sources of filth, should be cleansed and treated to a solution of copperas. Stagnant water should be drained. Let the sunshine into the rooms of the houses, and remember that pure water, pure air, and sunshine are the greatest natural preventives of contagious diseases.

These, in short, are the rules most generally adopted in the restriction of this destroyer of the young. They are as briefly stated as may be consistent with clearness, for there must be a comprehension of their scope and purport in order to exercise that influence and good which is the object to be attained.

Much more might be added, but this would lead to the consideration of medical subjects not deemed essential in directions for the guidance of the general public.

For information concerning the treatment of diphtheria it is necessary to look to the attending physician. He should supply you with this or some other pamphlet containing like information, which few busy practitioners have the leisure to verbally explain, and which few persons would be likely to remember.

The foregoing methods, modified by the attending physician to meet the exigency of the case, may be employed in all contagious diseases.

In order to effect the good which it is intended this pamphlet should accomplish, it should be given a wide distribution. It should either be preserved for possible future use, or should be sent to friends and neighbors who have need of such information in their distress.

Copies may be procured for free distribution by applying to the Secretary of the State Board of Health, Sacramento.

By order of the State Board of Health.

THE DANGERS ARISING FROM PUBLIC FUNERALS OF THOSE WHO HAVE DIED FROM CONTAGIOUS AND INFECTIOUS DISEASES.

Addressed to the Clerical Profession.

[CIRCULAR No. 2.]

The State Board of Health of California, realizing fully the benign influence of the reverend clergy of the State, and having a high appreciation of their functions as leaders and teachers of the people, would especially invoke their influence and coöperation in the instruction of the public in the principles of health and its preservation. Because of their general intelligence and widespread professional influence, they can exert greater *personal* influence than any other class or profession. Their visits are always missions of consolation and mercy. Unlike other professions, these duties are performed without fee or reward. There is thus engendered a confidential reverence for those so forgetful of self as to be ready at any and all times to speak words of hope, courage, and trust, when light has departed from the household and despair sits perched upon the family altar.

It may be superfluous to call the attention of so intelligent a class of men to a subject on which nearly all may have formed well-defined opinions; but having in mind the closeness of the pastoral relation to human life, the social standing of families, and the reciprocal feeling among friends and neighbors, it is deemed necessary to reinforce their convictions of what it is proper to do, by the conversion of such convictions into custom and law.

The Board, therefore, respectfully asks the attention of ministers of all denominations and of every order to the practice of holding public funerals of persons who have died of contagious or infectious diseases. In many cities and towns there exists a municipal regulation or ordinance prohibiting a public or church funeral of any person who has died of Asiatic cholera, smallpox, typhus fever, diphtheria, yellow fever, scarlet fever, or measles, and directing the family of deceased to limit the attendance to as few as possible, and to take all precautions to pre-

vent the exposure of other persons to contagion or infection. The person authorizing the public notice of death is also required to publish the name of the disease which caused the death of the person whose funeral is to be held. Where such local regulations are in force the clergy are relieved from the painful duty of refusal to perform such services.

Many amiable and otherwise well-informed people will importune the minister to officiate at a public funeral of a precious child that has died of diphtheria or scarlet fever. They cannot or will not understand that a compliance with the request endangers not only the lives of those present, but the lives also of the children of the kind pastor, who would not inflict pain by refusing, and of the children of sorrowing friends who inspect the remains in the casket, and follow them to the grave. It is to prevent such consequences that the suggestion is made that those of the clergy who live in cities and towns should so use their influence with the municipal authorities as to induce them to adopt an ordinance restraining any one from officiating at a public funeral in case of death from contagious diseases.

It is believed that considerations of personal and public safety need not be urged in support of the vital necessity of such action when addressing the clerical profession. If it were necessary to cite authorities to convince them that contagious diseases may be communicated by exhalations from the bodies of the dead, as well as by contact with living persons afflicted with the disease, they could be furnished without number. This would be the universal testimony of medical men. But it is considered unnecessary to furnish and multiply instances of infection and fatal results arising from public funerals in the case of contagious diseases. The principal thing is to refuse to hold such public services, no matter what the social standing of the family of deceased may be. Objections may arise to what at first may appear to be an extreme course. There is planted deep in the human heart a desire to honor the dead, and there are unfortunately many who think this can best be shown by a public funeral. They believe that to neglect public funeral rites is to manifest a lack of proper regard for the memory of the dead.

At this moment, when an atmosphere of sorrow and gloom pervades the home, considerations of safety for the living are apt to be received with indifference and contempt. Whatever is said to the bereaved relatives at such a time, must be spoken with the utmost gentleness. But they must be instructed as to the duty of subordinating their wish to honor the dead, to the duty of preserving the health and lives of the living. It is believed that most persons will yield in this matter if properly advised. But if any are unreasonable, and insist upon public funeral rites with an apparent disregard for the safety of others, the police power of the municipality or the State should be invoked to teach such persons that it is a high moral duty to forego their preference, and to subordinate their individual desires that the welfare of the community may be conserved. Fortunately, in California, sanitary legislation has been such as to invest cities, towns, and sanitary districts with all the powers needed for the protection of their respective localities. But as all know, such laws depend in a great measure upon public opinion for their enforcement. The sentiment of the community must be taken into account, and as the affairs of funerals have been almost entirely delegated to the church, ministers of the gospel stand in a position to

explain to the people how it is possible to manifest proper and fitting respect for the dead without disregard for, and danger to, the living. Not only should it be explained that it may be contrary to law, but that it is also thoughtless and selfish for the members of one family to insist that persons from many other homes shall be subjected to the danger of infection, in order that a public funeral service may be held over the unconscious remains of one who can neither be benefited by it nor injured by its omission. The clerical and medical professions agree on all important questions relating to the preservation of human life and the betterment of humanity. It is certainly desirable that the two professions that have to deal with the hopes and fears, the joys and sorrows, the life and death of mankind, as an inseparable function of their office, should enjoy each other's confidence and earnest coöperation in any measure calculated to ameliorate the condition of the human race.

It is sincerely hoped that the sentiments herein contained will meet the approval of those to whom this is addressed.

By order of the State Board of Health.

THE DANGERS ARISING FROM TAKING OFF THE HAT OUT OF DOORS DURING FUNERAL SERVICES.

Addressed to the Clerical Profession and Officers of Secret, Fraternal, and Beneficiary Societies of California.

[CIRCULAR No. 3.]

The frequency of reported cases of severe illness, and sometimes death, traceable to the removal of the hat at funerals, has determined the California State Board of Health to address the reverend clergy and the officers of secret, fraternal, and beneficiary societies throughout the State, respectfully directing their attention to the serious consequences which not infrequently follow the observance of the custom during the prevalence of inclement weather or under the rays of a hot summer sun.

The hat is used as a covering for the head. In an infinite variety of shapes and patterns the hat or cap has been worn from times of remote antiquity. In its various forms it has been known under different names, and adopted by some nations as a symbol. The most ancient form is the cap, such as is seen in figures representing the goddess of liberty. The Grecian *pileus* was a woolen cap sometimes worn as a lining to the helmet. The aged and infirm Romans wore caps of the same material for warmth. When conical, the cap was the *apex* of the Roman priests, worn probably from the time of Numa. With the elevated crest pointed forward, like the liberty cap, it was the Phrygian or Mysian bonnet. With a brim it became the *petasus*, a hat much like the round felt hats now worn. Among the Romans the cap was a symbol of liberty, and slaves were presented with one on receiving their freedom. In modern times it has been a conspicuous article of dress, and has been adorned with showy plumes, jewels, and rosettes. It has also been worn as a mark of authority, and its shape and ornamentation have frequently made it an insignia of rank and station. Its form, and sometimes its color, has been made to designate the rank and character of its wearer, as the monarch, by his crown; the cardinal, by his red hat, betokening his readiness to spill his blood for the sake of the

Savior; and the court fool, with his cap and a bell. In one form it serves to distinguish the military officer, and in another the peaceful Quaker. The wearing of a hat as an article of apparel is an almost universal custom. There must underlie the wearing of a covering for the head a deeper significance than a mere conformity with the prevailing fashion.

The spectacle of an adult person walking the streets or country roads, or laboring in the open air, without wearing a hat, would excite comment everywhere. Doubts of the mental soundness of the person would be freely expressed. The custom of hat wearing arose from necessity. Every one will acknowledge the warmth and comfort of a fur or woolen cap or hat in cold and stormy weather. The fashion of wearing the hair short increases the need of an artificial protection to the head, while to those who are bald it is indispensable to the preservation of good bodily health. Nurses often find it necessary to put a flannel bonnet on the heads of young infants before they can be cured of cold in the head and nostrils. A foundation for chronic nasal catarrh is one of the results of repeated colds during infant and child life.

Not one man in a thousand goes out of doors ten minutes of the day without taking the precaution to put on a hat. Experience has taught him that a neglect to do so may bring on a fit of sneezing, a watery suffusion of the eyes, a sore throat, headache, earache, neuralgia, toothache, and symptoms of a cold, with fever, a cough, and perhaps, pneumonia. So fully is this recognized in Europe that the custom of saluting ladies and friends by lifting the hat has been of late years greatly superseded by the wave of the hand, or half military salute.

Since the prevalence of la grippe, the risk of out-door exposure has multiplied. Many cases of severe illness, and not a few deaths have been noted from this cause. The most common occasions of danger have been during attendance on funerals, either as pall-bearers or mourners. In well-conducted funerals undertakers nowadays frequently furnish skull caps to be worn by pall-bearers. The skull cap, although it has no visor to protect the eyes, is nevertheless an efficient covering, does not offend our sensibilities, and implies no want of respect for the dead. The minister and the mourners may also be furnished with skull caps. There need be no discrimination in favor of the pall-bearers. But all reflecting persons will agree that it requires a stretch of the imagination to detect the difference in the effect between the wearing of an ordinary hat and the wearing of a skull cap on such occasions. Baring the head at funerals is a mere convention that serves no useful ceremonious purpose. Wearing a skull cap is no compromise; it is a surrender. The custom of taking off the hat in wet or cold and stormy weather while the remains are carried from the home to the hearse, or from the hearse to the chapel or lodge-room, and again when the last sad rites are performed at the grave, is fraught with danger. Ten, fifteen, and twenty minutes are not infrequently consumed, during which pall-bearers and mourners remain uncovered, while a chill wind, laden with damp, diminishes the vital resistance of the weak, and lays the foundation for a decline. The recently sick, the aged and infirm, and those who have lost the hair of the head, are in the greatest danger. But none are exempt. There are but few who, in the absence of suggestion, will defy the almost universal custom of Christian nations to uncover in the presence of the dead. Their sentiments of love, honor, and respect for the dead impel them to disregard the danger

involved by the exposure, notwithstanding a full comprehension of its evil import.

It is on such occasions that the intelligent and masterful influence of the ministry and chief officers of lodges and societies having the burial in charge may be exercised in the beneficent advice to remain covered, and avoid discomfort and danger. This can be done with neither injury nor disrespect to the dead, but with great kindness and benefit to the living. Speaking with authority, and themselves setting the example by remaining covered, they administer comfort, relief, and protection, and with certainty lessen apprehension for the results of the necessary exposure incidental to the interment.

A desire to live to a fullness of years is instinctive in all men. It is believed that the pursuance of the course herein indicated will not only be the means of preventing much sickness, but may be the means of preserving many useful lives. That the efforts to prevent disease shall at least equal, if it does not exceed, the art of cure, is one of the possible triumphs of modern civilization.

By order of the State Board of Health.

REPORT OF STATE ANALYST.

The Act creating the office of State Analyst, and defining his duties, was intended to provide a way for accomplishing the following ends:

- I. An official analysis (made with the greatest care) of the mineral waters of this State.
- II. A most careful investigation of the drinking waters of the State, as supplied to the larger towns and cities, and to its public institutions.
- III. An examination of the food products of the State, including milk and ordinary foods.
- IV. An examination of drugs, medicines, etc., for strength and purity.
- V. An examination of the wines produced in the State and others offered for sale in the State, and to do such other work as the State Board of Viticulture may desire.
- VI. To examine such ores, minerals, etc., as the Mining Bureau may desire.

And finally, the State Analyst was made the Chemist of the State, subject to the call of several of its important Boards, either for information, advice, or chemical analysis.

The Boards specifically mentioned were the State Board of Health, the State Board of Viticultural Commissioners, and the State Mining Bureau, to which might with propriety be added the State Board of Horticulture.

If the office of State Analyst was supported and maintained as the Organic Act contemplated, the State Board of Health would find its field for usefulness very much enlarged.

No argument need be offered in support of the regular official examination of drinking waters of the State. It is known to every person that there is no other channel through which so many disease germs enter the body. Contaminated drinking water carries disease and death to unsuspecting and helpless persons. The weak, the young, the invalid, the convalescent are the first to suffer from its concealed poison. The water may be clear and palatable, and have all the appearance of purity, and yet be injurious to health. The individual is entirely powerless to avert its evil effects. It is clearly the duty of the State to protect him in his health, and against the insidious attacks of unseen foes.

This work is being begun in a more or less efficient manner in other States. I shall make special mention of Massachusetts, because this State has inaugurated a system of good inspection, and carefully carried it into operation. The Legislature of that State has appropriated annually, for a score of years, \$5,000 to the State Board of Health, for the examination of the milk, food, and water supply, etc., of the State.

That State has done more than this. It has, within the last five years, expended \$100,000 in the special investigation of the water supply of the State. The improved sanitary condition of the State is the return for this expenditure. Massachusetts is not a State given to lavish

expenditure without reason, yet intelligent enough to know a good investment. The milk supply was improved in quality almost immediately upon the passage of the law creating and providing for a milk inspection. Year by year the reports of the Board of Health show continued improvement. There are fewer cases of suspected adulteration, and the analysis shows a smaller and smaller amount of adulteration in the samples examined. The legislation already enacted in this State makes it easy to inaugurate such a food inspection as is maintained in Massachusetts.

It is generally admitted that California has within its borders a large number and a large variety of mineral springs. These are located in wild, out-of-the-way places, and no development of these springs is possible until an analysis has demonstrated their value. The mineral springs of Germany were first examined at the State's expense, and a fund is set aside for the analysis of mineral waters within the limits of the State. Our own people visit the mineral springs of other countries, and spend large sums of money abroad, when, beyond all question, we have equally curative waters at home. For every dollar spent in this investigation of the mineral springs of the State a hundred dollars would be saved. If, added to the attractions of climate, we offer the proofs of the great value of our mineral waters, then we would attract many health-seekers who are not drawn here by climate alone. California can become the great sanitarium of the world. Too much cannot be said of the importance of the work placed upon the State Analyst. Experience has shown that nowhere can food inspection be made efficient if the State does not provide for a free analysis, and also for a systematic inspection of the same, and collection of samples.

The University of California has constructed a large, convenient, and well-equipped chemical laboratory. Provision has been made in it for the work that would fall to the State Analyst, so that it would be very easy for the State to take up this work and carry it forward with efficiency. The additional burden upon the State would not be felt. No man, woman, or child in the State, no taxpayer, would ever know or feel that this work was a burden to him. On the other hand, thousands upon thousands of the common people would be benefited by protection from disease germs, whether conveyed in water, milk, or other substances.

In view of the importance of the work to be done for the people of the State, and also in view of the small cost to the State, it is hoped that the incoming Legislature will see its way to make provision for the maintenance of the office of State Analyst.

Respectfully submitted.

W. B. RISING,
State Analyst.

RECOMMENDATION MADE BY THE STATE BOARD OF HEALTH.

The foregoing report of the State Analyst was received after the Biennial Report of the State Board of Health had been sent to the State Printer, which prevented the making of a recommendation with reference to an appropriation sufficient to meet his requirements.

The Secretary has on several occasions forwarded to Berkeley samples of water and other substances received from different parts of the State, to be analyzed and reported upon. The receipt of the packages was in every instance acknowledged by the courteous State Analyst, with the statement that it would be impracticable for him to comply with the request, inasmuch as his duties would not permit him to do it personally, and, further, that the State had made no provision for the employment of assistants. This has rendered the office of the State Analyst, so far as the State Board of Health is concerned, a nullity.

The law directs that the State Analyst shall make analyses of waters and substances sent to him by the State Board of Health, but, as it seems, no appropriation has been made wherewith it could be done. It is certainly necessary that the office of the State Analyst shall be something more than a name; and it may be necessary, in case cholera should reach our State during the next summer, to utilize the well-equipped chemical laboratory of the State University, by submitting to the State Analyst the contents of human viscera of persons suspected of having died of cholera, or of poisons administered with criminal intent during the prevalence of cholera.

This, in addition to the considerations embodied in his report, should be sufficient to show the necessity of an appropriation sufficient to meet the requirements of the State Analyst.

For this purpose, the State Board of Health would respectfully recommend that the Legislature shall appropriate \$1,500 per year for the next two years.

DIPHTHERIA; ITS COMMUNICABILITY AND PREVENTION.

By C. A. RUGGLES, M.D.

An experience of many years in sanitary matters has brought me, reluctantly, to the conclusion that great ignorance pervades the public mind regarding the origin, communicability, and prevention of disease. The existence of that ignorance is almost inexcusable, for it is plainly the duty of State and local Boards of Health to so instruct the people, so educate the public mind, that it can duly and clearly appreciate the great blessing of health and how to preserve it. In consideration of the above-stated condition, I have thought proper to present for public thought a few practical points in relation to diphtheria, which has for the past year been unusually prevalent in many parts of the State. Microscopic investigation has demonstrated beyond a reasonable doubt, that the pathognomonic feature of diphtheria, invariably present, is the specific micro-organism known as the *Kleb-Loeffler bacillus*.

The researches of *Kleb*, *Loeffler*, and others have abundantly proved that this bacillus is the causative agent of diphtheria, and that it produces, at the point of infection, a chemical poison whose absorption into the circulation gives rise to important symptoms. The mind of the profession has been much disturbed by the difference of opinion as to whether this disease is local or constitutional. It is at the present time almost, if not quite, universally admitted that it is, at its very outset, entirely local, and the sooner medical men come to that conclusion, and instruct their patrons as to that fact, and the sooner the disease is discovered and proper treatment applied, the better will be the prospect of saving the unfortunate patient. Though particular or specific plans of treatment are not the object of this article, yet all treatment should be based upon this one fundamental fact, that diphtheria is a local, specific disease, due to the presence and action of bacilli, characterized by a deposit of pseudo-membrane at the site of infection, accompanied by constitutional disturbances and followed by nervous symptoms due to the absorption into the circulation of a virulent agent, *tox-albumin*, which is produced by the local development of the bacilli. To treat diphtheria understandingly and successfully, the medical attendant must be prepared to admit that the disease is local, and the treatment should be of a local-topical character at first, for, according to the best authorities on this subject, the bacilli develop only locally at the site of infection, and are found in the pseudo-membrane only, mostly on the surface, not even in the subjacent mucous membrane. They do not invade the tissues or circulation, but generate at the point of infection this highly poisonous substance, the absorption of which produces the constitutional disturbance. If these views respecting the nature of this disease are correct, and the consensus of medical opinion is that they are, it seems as if vigorous local treatment is indicated to destroy the bacilli and prevent as far as possible the formation and absorption of

the *tox-albumin*. This plan of procedure is mentioned simply to forcibly impress on the public mind the great necessity of early application of treatment. When it is fully understood that the pathological element of this disease is the *bacillus* in the exudation, it will be readily conceded that it is communicable; that it is highly contagious, equally so as smallpox, and much more fatal in its results, as mortuary statistics show that there are ten times as many deaths from diphtheria as from smallpox. We can control smallpox by vaccination, which we cannot do with diphtheria. When the people will consent to be quarantined, and as cheerfully isolate and guard against it as against smallpox, then much will have been gained towards its prevention.

The contagiousness or communicability of this disease is now almost universally conceded by all medical men; possibly excepting a very few of questionable respectability, whose advice and counsel have done much to hinder and obstruct the efforts of Health Officers to control it, by destroying that confidence that should always exist between the people and sanitary authorities. If it is not contagious, then, they say all efforts to suppress it are unnecessarily rigid and arbitrary. One more point that I wish to forcibly impress on the public mind: That is that for sanitary purposes, at least, diphtheria and membranous croup are identical. Innumerable instances could be cited where croup diagnosed as such, treated as such, and tracheotomy performed for its relief, has given to children exposed to it, unmistakable diphtheria. My opinion is that physicians should be obliged to report their cases of croup to the local health authorities in the same manner as any other contagious disease. The public should be instructed up to the knowledge of the necessity of being just as careful in the management of a slight case as of one more severe, as it is possible for a very bad case to arise from a very mild one. Diphtheria attacks all ages. It exempts neither the nursing babe nor the adult. It appears more disposed to attack scrofulous children and those with large prominent tonsils and enlarged cervical glands, as they offer a larger field for the lodgment of the bacillus. It having been clearly demonstrated by microscopical research that the pathological feature of this disease is the *Kleb-Loeffler bacillus*, and that it develops locally only at the point of infection, it would seem our duty to tell parents to early and carefully examine the throats of their little ones, and if an unusual redness of the tonsils and pharynx be found, which may soon be followed by the development of a thin yellowish membrane or exudation, it is very good practice to resort thus early to medical treatment. Call your family physician early, believing that by attacking the disease thus in its early stage with the proper germicides before the generation at the point of entrance of the highly poisonous substance, the absorption of which produces the constitutional symptoms, much will be gained.

The suspicions of the parents having been verified by the medical attendant and the Health Officer, the most important duty of the sanitary department commences in using every known means of prevention. The strict quarantine of the whole family, children and adults, is in my opinion the only successful measure to stamp it out. In every community are people ignorant about sanitary and hygienic measures, who are not willing to undergo any individual inconvenience for the sake of improving their sanitary condition and lessen sickness and death among them. Where the welfare of the community is at stake,

individual hardships should not be considered, and the cry of violation of individual rights should not be heeded. Why should diphtheria not be as strictly quarantined as smallpox? It is in many instances difficult to carry out strict quarantine, but a Health Officer who, as a celebrated sanitarian aptly remarked, is not afraid to be cursed and sworn at daily by his profane neighbor, can, with the aid of the proper authorities, accomplish it easily enough. After proper external quarantine measures have been instituted to protect the community, we should put in force regulations for the better protection of those confined in the house with the sick one. There is no question as to the contagiousness of this disease, and it can safely be laid down as a sanitary axiom that whatever is communicable is preventable. Now, our whole aim and purpose should be to prevent it spreading. The one thing important and absolutely necessary to accomplish that end is complete and thorough isolation. A large, airy room should be selected, preferably at the top of the house and on the sunny side. An open fireplace is an advantage to perfect ventilation. Carpets, curtains, mats, and ornaments, in fact all unnecessary furniture, should be removed. A special attendant should be selected, and none other should be allowed in the sick-room. Dishes, towels, clothing, bedding, and utensils used in the room should remain there, and not be allowed to enter any other part of the house. Clothing of the cheapest kind only should be used around the patient, so that it can be burned without unnecessary hardship to parents. Soiled clothes that are worth saving should be immediately placed in a bichloride of mercury bath and thoroughly disinfected. The discharges from the nose or mouth should be received on old pieces of cloth and immediately burned. The excreta should be received in glazed-ware vessels containing the bichloride mixture. Cats and dogs should not be allowed in the room, for they are often the means of spreading infection.

The sanitary condition of closets, sinks, traps, and pipes should be closely examined and rectified if defective. The more particular and precise we are in these arrangements the more perfect will be the isolation, and consequently the safety of other members of the family the better secured. The infective bacilli being present in particles of the exudation which are coughed, sneezed, or spat up and in the saliva and mucus from the nose, readily attach themselves to the clothing of the patient or the attendants, to the walls, furniture, bedding, books, dishes, papers, or may become dry and float in the dust and air of the room; therefore, the necessity of perfect and thorough methods of disinfection, aiming at nothing short of destruction of the bacilli, is very clear. When the attending physician and the Health Officer are perfectly satisfied as to the complete recovery of the patient, it may be bathed with a weak solution of bichloride of mercury, particularly the hair, and in a clean suit of clothing may be allowed its liberty. The room in which the sick one was confined should be tightly closed and thoroughly fumigated with sulphur fumes.

It is advisable to saturate the air of the room with steam while the sulphur is burning. About five pounds of sulphur to one thousand two hundred cubic feet of air space is sufficient; the room to remain closed for six or eight hours. Then the floors, the bedstead, and all woodwork in the room to be washed with the bichloride of mercury wash, about one ounce to five buckets of water; wallpaper to be renewed and woodwork to

be repainted. It has been satisfactorily demonstrated by numerous experiments by scientists that unless there is a certain saturation of the air in the room to be disinfected, the sulphur fumes alone are useless. If you stop short of that degree you have not disinfected the room; you have simply subjected the germs to a high temporary inconvenience and left them to recover in a short time. When diphtheria is present we are frequently asked is there any way adopted to diminish the risk of infection? When one member of the family is affected, as before stated, complete isolation should be enforced at once, and parents should be very urgently warned of the danger of fondling, petting, and most particularly of kissing the sick one; as many of the family as possible, especially the children, should be sent away. If this cannot be done, a careful daily inspection of the mouth and throat should be made. Chlorate of potash gargles and tablets should be freely used to keep the secretions of mouth and throat healthy. The period of incubation is stated by many authorities to be about eight days; therefore, I would always insist that the quarantine should not be raised until the eight days have expired.

Notice of the sickness should be sent to the Superintendent of Schools, so that certainly no one from that family should be admitted until provided with a certificate from the Health Officer, who should not issue it for at least two weeks after the discharge of the family from quarantine. In case of death the funeral should be strictly private, the body of deceased being wrapped in cloths soaked in bichloride of mercury solution and placed in an hermetically sealed casket. In presenting these few practical ideas, divested as much as possible of scientific and technical phrases, to the public, it may appear strange for me to make a suggestion or give advice to medical gentlemen, but I think it well to show up the great inconsistency of some physicians who will well and truly explain to the parents of the sick one the great necessity of being very careful, so that the disease may not be communicated to others of the family; who will learnedly and very scientifically talk about the easy lodgment of the diphtheritic bacillus on articles of clothing and furniture, and tell how tenacious of life these germs are, how long they remain active, for four, five, and six months, and yet after that learned dissertation, and after having applied topically his germicides during much struggling of the patient, who coughs and spits out pieces of exudation on the hands and clothing of the doctor, will leave that patient, and, without any disinfection, or the least idea of doing wrong, visit his own family and children, or the family and children of his patrons. What better medium of communication could be desired? My opinion is that such conduct is culpable, as well as inconsistent. He should thoroughly disinfect with the best known means, and take no risks as to himself spreading the disease.

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VENTILATION AND FOUL AIR AS SOCIOLOGICAL FACTORS OR MODIFIERS.

By P. C. REMONDINO, M.D.

To most persons the subject of "climate" conveys but the most indistinct and undefined idea. They are too apt to look upon "climate" as a corporate, distinct, individualized, and constant element, possessing distinct and varied specific properties, made so by what are generally considered climatic factorial elements, to wit: longitude, latitude, altitude, and surrounding physical geography. This is all very well as far as it goes, but as observed by a British author, there is a broader view, in which we must observe the subject of "climate." In touching upon the subject, he says: "In what has been said, it has been repeatedly hinted that narrow views may exist as to what goes to form *climate*, and that there may be misunderstandings regarding some of its constituents. Temperature, pressure, moisture, motion, etc., are never forgotten, though often very unintelligently considered; but there are many to whom it never occurs that there may be a *chemistry of climate*, and that airs may differ not only in such things as heat and moisture, but in the proportions of oxygen, nitrogen, and carbonic acid which they contain, as well as in the presence in them of special substances, either held in solution or in mechanical suspension. That such is probably the case, every one is ready to admit, yet practically in works on medical-climatology air is just air all the world over. It is true that for many years back experimentalists have labored to show that there are airs and airs as well as dukes and dukes; but still, even at so late a time as in the last years of his life, Dalton said that chemical experiment could not distinguish the air of Manchester from the air of Helvellyn, and it must be remembered that Dalton was equally distinguished as a chemist and as a meteorologist. Cavendish, too, could not decide that the air of London differed chemically from that of the country. Dalton was far wrong, however, as is clearly shown by his distinguished pupil, Dr. R. Angus Smith, in his recent work on 'Air and Rain.' Dr. Smith, we think, originated the phrase '*chemistry of climate*,' and in this work he gives us an extraordinary contribution of facts to the phrase."

To the ordinary observer, the labors of Dr. Smith have but little significance; but this able pioneer, in a field of science that has since been well surveyed, was actually analyzing and investigating elements which, in their presence, as to quantity and intensity, are actually the most potent sociological factors imaginable. How these elements can so act as to demoralize man and convert human beings into brutes, drunkards, prostitutes, and depraved beings generally, and how the opposite conditions can reclaim him, is the object of the following pages.

Nothing in the field of study will so show the homogeneous origin of many etiological factors of disease, sociological conditions, and many

anthropological traits, as the following of the paths of investigation marked out and first trod by Dr. Smith, and no branch of science is more broadly applicable to the amelioration of mankind. It is well to show the utter folly of attempting to treat the mental, moral, and physical natures of man from separate and differently sustaining points, because we have, more than from any other point of observation, observed the close and intimate, as well as inseparable relations, that exist between these natures of mankind, at the same time that we have seen the indestructible interdependence that we must well understand—an interdependence that unfortunately is but little understood, and but too often entirely ignored by those who desire to accomplish the most—the clergy. This is a fault, traditionally connected with theology, with which it seems to be hampered and so clogged, that it really seems as if theology and sound, rational, moral philosophy, based on a physical philosophy, could never at the one and same time hold possession and direction of the one mind. Modern theology, like primeval, ancient, and mediæval theology, will continue to cling to the divine origin as well as the divine power of cure of diseases, perversity, immorality, and devilry in general. The clergyman, somehow, feels that to give up all this will place him in an undesirable position; that much, if not most, of his power will depart from him. Uneducated minds also find it much easier to depend more on prayer and on Providence than on science for their welfare and safety, as the former takes much less study, care, and expense, and is, whilst health and life last, the least incommoding, free-from-care lives; whilst he who depends and lives up to the teachings of science has many things to look after, avoid, and remedy, that his Providence-depending brother is free from. But in return, the rational being is less prone to sickness, being less subject to typhoid fevers, diphtheria, consumption, and such diseases, as well as he is less subject to insanity or milder mental derangements, criminality, and the like order of afflictions. A mental and physical dormancy or a constitutional tiredness favor a greater dependence on Providence than on science, and as these conditions, born of laziness, are apt to continue, theology will always find a fair measure of support from the unenlightened and lazy, or obdurate-minded, and continue to flourish. If the honest and conscientious clergy, however, could once be properly started, and made to appreciate physical facts, morality would be the greatest gainer. With these preliminary remarks, we will proceed to discuss the subject of ventilation.

Unimpeded ventilation accomplishes several objects. It is not alone in the necessary aeration of the blood that perfect ventilation assists us on the road to health and long life, with a better capacity for its enjoyment, but by its free and constant action, and the thorough diffusion and dissemination of the air, it also tends to render inert and harmless those disease germs and fomite productions that are the curse of populous centers; by ventilation we either prevent or mitigate the evils that may arise from the presence of either fomites or ochlesia. The general populace believe too literally that "sufficient for the hour is the evil thereof" to worry over the fact that disease germs have an inherent tendency to a tolerably long life, provided they are protected from the light and air.

When an episode occurs like that connected with the tearing down of the fever ward in the old New York hospital, where three out of the five masons engaged died of putrid fever in a few days,* or a case of diph-

*Hospitals and their Construction, by W. Gill Wylie.

theria or typhoid fever occurs in a room which has had similar cases a year or so previously, they are necessarily struck with the fact that the disease lurks about where it has once been, without its once occurring to them that this lurking is due to a tangible explainable cause, a physical avoidable result, and just as plain as that when you sow barley in the ground, Providence permitting, you will surely gather a barley crop. The fact that an old mattress, a manure heap where the stools have been emptied, drinking or bathing water, the dust in the crevices in or beneath the floor or in the wall, or wallpaper, carpets, or bedding, may have retained and conveyed the infection,† does not connect the fact to the popular mind that all these vehicles have carefully shielded and protected the germ from the air, or that most germs have at best but a short life if freely exposed to the air, and a remarkably short one if that air be dry, warm, and sunny.

Recent experiments on the bacillus of tuberculosis have shown it to retain a wonderfully long vitality, extending for years when buried in the ground, while Koch has demonstrated that in the air and sunshine its vitality is limited to some minutes or hours. In the Crimea, the ground occupied by the French and English army became so foul that the project of reducing Sebastopol nearly came to an end without any further diplomatic or armed interference on the part of the Russians. By digging long trenches in the shape of a cross, and building fires at the intersections of the lines, the ground was drained of the mephitic gases that threatened the destruction of the troops. The shifting nomad avoids all these dangers, and, as will be explained further on, he also escapes infection from cast-off clothing, the fact of the exposure to sun and air of the clothes having destroyed all infection being one reason, and his own better aerated blood being another.

From the above it will be seen that ventilation means more than the simple breathing of a purer air. It also means less danger from infection and disease, while deficient ventilation not only prepares the body and mind for disease and infection, but it also furnishes the viable causes for the disease and infection; hence the importance of the subject in a much greater sense than the one in which it is generally considered.

The busy practitioner, daily occupied with the struggle with disease, has his attention fully taken up with the therapeutic necessities of the cases before him. He is expected to know what will relieve and alleviate in this or that case; this is all the patient asks of him; and as he may be successful in this regard, so goes his reputation as a physician. This is really all that the community expects of him. Should he refer to past events, nothing strikes the patient as of any importance, unless it be some serious physical accident or illness that may have preceded the present complaint. A business reverse, domestic affliction, or a severe mental strain, perchance a candidacy for office in some exciting election, or doing business in an unhealthy locality or unventilated apartment, may have come and gone, but to him these are of no importance; if he cannot go back for a starting point to a steamboat explosion, a railroad collision, or a "bad cold which settled on his chest," he cannot see any reason why his present illness should antedate its commencement beyond a day or two. He may have had occasional headaches, probably even some disordered vision and slight vertigo, or, perhaps, felt at times unaccountably tired, forgetful, and an inaptitude to attend to business,

† Condensed Report on Typhoid Fever, Maine State Board of Health Rep., 1889.

but these are mere nothings, in fact it was not even worth mentioning; a seidlitz powder, or a peptonic or soda-mint tablet, generally has set him all right. He does not wish you to think that there is anything serious about him, as he knows full well that there is not; if you will be kind enough to prescribe for his present ailment, it is all he desires.

So it goes. Disease is simply looked upon as something that has a spontaneous origin. The past life, trials, and exposure are supposed to have left no trace or effect on the organism, and the future is expected to look out for itself. Poor patient! he plods along in blissful ignorance that the slight ailment, headaches, or weariness are but the picket-firing of the distant outposts to warn the main body of the approach of an enemy, while he, unheeding and in fancied security, finds himself a prey to his foes. The laity are not altogether blamable for their ignorance in these matters. Our profession has not taken the pains to have them enlightened, and, unfortunately, that very occupation in which we are daily engaged, the healing and reparative art, often obscures from our field of vision that preventive branch of our science to which we must soon look as to something of paramount importance, if we wish to raise a rampart against the rapid encroachments of the physical, intellectual, and moral degeneracy which is fast undermining the great mass of the population in civilized nations.

Statistics may at times be erroneous and unreliable, but there is no mistaking the fact that nervous and morbid irritability, as well as idiocy and lunacy, are on an alarmingly rapid increase. In England alone—where statistics are reliable—since 1859 the increase has been excessive, the total of idiots and lunatics being, after making all allowance for increase of population, all of 33 per cent greater than it had been for the same period of time previously. Throughout the land, asylums, hospitals, retreats, jails, and like institutions for the physically or morally wrong are multiplying, and infirmities and depravity are increasing at an equal pace. We all admit that for certain effects there must be specific causes. To find this cause falls to the province of the hygienist and demographer. As physicians, we are well aware that a pathologist must of necessity first be an expert physiologist; he must first understand the condition of the tissues in health and their normal action to be able to appreciate when they have deviated therefrom.

Let us, for example, take the Indian of America. Catlin tells us that in all his observation, both in North and South America, he never saw an idiotic, lunatic, deformed, rachitic, deaf, or dumb Indian, either male or female; neither did he, at any time, after the closest inquiry, find a tribe that ever had any premature mortality, deaths from teething, cholera infantum, or infantile diseases; neither did the women abort or have premature births.

My own observation among the Sioux, Chippewas, Winnebagoes, and the California tribes of Indians is confirmatory of the above; to which I might add, that although I have seen many of them drunk, I have yet to see the first case of delirium tremens in an Indian.

Benjamin Ward Richardson, in an instructive lecture delivered in 1885, before the Association of Sanitary Inspectors, reviewed the relations of the nomadic or homeless people of England in their relation to health and disease. He observed among this class a peculiar exemption to infection from zymotic diseases, mentioning particularly the gypsy, whom he has seen camped in neighborhoods infected with scarlet fever

without incurring any risk, and he has never seen one marked with smallpox; these people have neither phthisis, scrofula, or any kindred diseases. From my own observations I do not remember ever seeing a feeble-minded, idiotic, or lunatic gypsy.

If, in a family of six, we were to find three who had partaken of some particular article of food, who were very sick, and the other three who had not touched it well and uncomplaining, we would be safe in assuming that the particular dish was the cause of the sickness in the first three. Now, if one of the well ones should accidentally or intentionally eat of the same dish, and likewise sicken and present analogous symptoms to the other three, we then would have conclusive evidence that this dish was the real and only cause of the disturbance.

If we apply the same rule to the general physical conditions, we find that barbarous and nomadic people were all in the enjoyment of the best of health; that finally a portion became civilized, and then began to house themselves in; that with this change in their habits and customs also came ill-health, physical and mental ailments, and general degeneracy. We notice further, that those who still follow the old nomadic habits retain their health and enjoy exemption from disease, but we also observe, that whenever any of these adopt the customs of the civilized man and go on and house themselves as the others have done, they sicken, and that their children become like the children of the close house-dweller—a prey to all kinds of ills and to premature mortality. That the change from an out-door to an in-door life is the cause of the departure of health is self-evident, and still better confirmed, when the close house-dweller partly resumes the more open-air life of his ancestors and is found to have regained lost health and exemption from disease. It needs neither bacteriology nor the pathologist to confirm our deductions.

Some years ago an Indian agent built a number of farm-houses for the Indians in his charge. What was his surprise, when on a visit some time subsequently, to find the house littered with the harnesses, plows, saddles, with other farming implements, and the Indians camped at a safe distance in their tent. On inquiry, the Indians told him that the house had made them all sick, and that some of them had even spat blood, and that they had moved out and were now all right.

There can be no doubt that the difference in health, depravity, and mortality that exists between strictly nomadic people, uncontaminated by border civilization and civilized man, can be attributed in a great measure to mode of habitation, as we find that those who live in large and well-ventilated houses, or whose occupation keeps them out of doors, and where the climate allows of free and constant ventilation at all seasons, that the people more nearly approach the state of perfect health enjoyed by the nomad.

Popular opinion on the subject is very crude. The majority have in some manner a vague idea of a carbonic oxide that kills, and some of the better informed will tell you of the Grotto del Cane; they have also some idea regarding the favorite Parisian mode of suicide; and they are not astonished at such occurrences as that of the Black Hole of Calcutta, the ship "Londonderry" with its seventy-two dead in the steerage, or at the English sloop that smothered all of its seventy passengers between Jersey and Southampton; they also know that they should not venture where a candle will not burn. In my opinion it is the erroneous views

that they hold that prevent them from really and fully realizing that there are unseen dangers in unventilated apartments besides mere unrespirable air, and that the cause which daily places people where they are sure to suffer irremediable injury is their lack of knowledge concerning the real dangers. They rely for safety on the fact that the light burns brightly in a certain atmosphere, and that therefore they run no danger, the burning taper being their criterion of the respirable condition of the air. The laity should be taught, what De Saussure long ago demonstrated, that the fresh, invigorating, effervescing mountain air contains a greater percentage of carbonic oxide than the air of the plain or seashore, and that on a bright day the air of a London or New York park actually contains a less percentage of carbonic oxide than the air of the Catskills or the hills of Scotland. They should realize that carbonic oxide is not inimical to life, but only cannot support life; and that persons going into a carbonized air that will hardly support a candle alive, have actually at first not even found it objectionable; and that but in a few isolated instances this is the last source of danger from unventilation. We are not now speaking of the absence of oxygen, but only of impurities that mingle with respirable air. They should also understand that any injury, or even asphyxia, that may result from the presence of carbonic oxide gas in excess—that such sickness is quickly recovered from, provided the condition is not pushed too far. Where there is danger, however, the calamity occurs suddenly, and where the recoveries are made, they are as prompt.

As has been pointed out by Brown-Sequard and D'Arsonval, the morbid element in respired air is the pulmonary emanations, to which they might have added the perspiratory effluvia. The great delineator of the human passions and frailties, Shakespeare, has well depicted the effect of this effluvia from skin and breath in his "Julius Cæsar," where the rabble so yelled with a deal of stinking breath and threw up their equally stinking, sweaty night-caps, when he refused the crown, that it caused Cæsar to faint and Casca to hold his breath for fear of taking some of the poison into his own lungs.*

The best account of the effect of this organic poison is from the pen of Dr. Holwell, one of the twenty-three survivors who escaped alive from the Black Hole. His account, written in 1757, fully shows each step of the action of this intoxicant and narcotic poison, which, after many hours, left him still conscious, but "sensible of no pain and of but little uneasiness, with a stupor coming on apace, in which condition I laid down to die in peace, and gradually became unconscious." The maddening, intoxicating phrensy of men, as described by Holwell, cannot be ascribed to the mere fear of death, as British soldiers have met death, going down with dressed ranks in a foundering troop-ship that confusion might be avoided and the women and children saved. In that tempest and storm-tossed ship, however, there was not that poison from animal effluvia accumulating in their blood like fusel oil.†

Hutchinson well observed that "we unwisely neglect the study of the differences that exist between man and man—a difference that, for the most part, physiology takes little cognizance of, but which may prove of much importance in modifying the processes of disease."* In our zeal to

* Julius Cæsar, Act I, Scene II.

† Family Physician, chapter on Hygiene, published by Cassell & Co., London.

* The Pedigree of Disease.

master or to carefully study the disease, we are so apt to make it a self-consistent condition, and become so absorbed in our research, that we are apt to lose sight of first principles. Hutchinson deprecates this tendency; and Richardson—in speaking of our classification of disease as “unsystematic and fanciful, and its nomenclature imperfect, even for the technical purpose of language, and inapplicable for the higher development of medical scientific research and practice”—also felt that we were drawing away from first principles.† Were we to keep in mind that heredity is only an acquired or cultivated habit; that, as our forefathers in the days of Tacitus roamed through the forests of western Europe without aid of spectacles, the physique of the German, Gaul, Goth, or Briton was the admiration of the warlike Romans, whose superior arms and discipline alone enabled them to overcome them; and that these men had neither gout nor phthisis—we could not reasonably say that we owe our infirmities to their simple, martial, out-of-door life. Heredity must, therefore, have had a subsequent origin so far as our diseases are concerned, and, as they do not originate spontaneously, where did they begin? Morel, in his work on the degeneracy of our race, places toxæmia as a primary cause.‡ Toxæmia has several sources from which it may result, and a careful study into the original cause of diseases will generally result in establishing the fact that outside of those originating in a specific disease germ, some form of toxæmia is generally the starting point of sickness, and that even most of the other diseases that owe their origin to, or that can be propagated from, a bacillus often themselves have their primary birth in toxæmia, whether it be from over-feeding, uræmia, or infection from the emanations of respired air, or from some animal or vegetable decomposing matter. From whatever source it may come, it often produces precisely the same results.

In a paper read before the Southern California Medical Society, entitled “A Plea for Circumcision,” I showed that one of the main dangers or results from reflex irritation lies in the toxæmia that it may induce. In the paper mentioned, I followed the different reflex processes due to phymosis up through to the obstinate and irremediable constipation due to sphincterismus, a condition described by Agnew,§ of Philadelphia. In following up the different steps that the condition assumes, I showed the immense importance that Sir Lionel Beale attaches to blood composition as the ground-work of health or disease, wherein he truly observes that “blood changes are the starting points, and may be looked upon as the cause of what follows,” the other factors being the “tendency, or inherent weakness or developmental defect, of the organ which is the subject of attack.” To which he adds, that he feels convinced that if only the blood could be kept right, thousands of serious cases of illness would not occur; while the persistence of a healthy state of the blood is the explanation of the fact that many get through a long life without a single attack of illness, although they may have several weak organs, and that an altered state of the blood, a departure from the normal physiological condition, often explains the first step in many forms of acute or chronic diseases.* Sir Lionel might have added that the “tendency or inherent weakness or developmental organic

† Diseases of Modern Life.

‡ *Traité des Dégénérescences Physiques.*

§ Agnew's Surgery, Vol. I.

* Beale. Urinary and Renal Disorders.

defect,” which, after all, is all the foundation or ground-work for the hereditary diathesis, is itself the outgrowth of transmitted toxæmic tendencies, or conditions affecting former generations, or of previous toxæmic results in the individual itself, as we can safely assert that our fathers, of barbarian memory, left us no inheritance of developmental organic defects. The daily increase of these physical defects shows plainly that they are so, not from inheritance, but from present causes or cultivation, as well as it plainly explains that toxæmia lays the tendency to reflex troubles, also on the increase, which in turn favor further toxæmia by the disturbances, deterioration, and morbid sensitiveness that they occasion—the retroactive effects of either good or bad physical condition being here fully exemplified. Fothergill shows how this condition of blood, whether due to reflex irritation, unventilation, or overfeeding, or from mental disturbances, eventually results in uræmic difficulties which engender kidney disturbances, notably Bright's disease, and that instead of these diseases being the cause of the uræmia that finally takes off the patient, the uræmia is the real starting point of the kidney disease, which goes on until such structural change has been effected that we reach that point where the kidney is no longer equal to its functions—the renal inadequacy of Sir Andrew Clarke.†

In the Bradshawe lecture, an extract of which appears in “Braithwaite” for January of 1889, William Carter observes as follows: “According to Bouchard, one fifth of the products of the total toxicity of normal urines is due to the poisonous products reabsorbed into the blood from the intestines, and resulting from putrefactive changes which the residue of the food undergoes there.”

One of the changes that full respiration in the open air effects in the blood is the destruction of these toxic elements. This is mentioned for the purpose of explaining the intimate relations that exist between all the causative conditions, physiological or pathological, that tend to induce toxæmia. The large-lunged and deep-chested Indian will eat at one meal as much food, indiscriminate as to quality or state of preservation or of putrefaction, as will an ordinary white man for three days, or even a week; but toxæmia, with the attending ills, does not find in the Indian a favorable resting-place, so that after the most gourmandizing meal he is in no more danger from toxic absorption than he is from an attack of delirium after the most generous or protracted drunk. Former perfect aeration of the blood has not left him with any developmental organic defect in the minute structure of his organism, and the present perfect condition of his respiratory apparatus oxidizes and works off into the outer air all the toxic products that are brought to it. He needs neither pepsin nor naphthalin to insure him against toxic accidents.

It is evident that we have different sources by which the blood can be charged or overcharged with toxic products, but it must remain fully as evident that nature has given us the organs of respiration for their elimination. The skin and kidneys are depurative mediums, and very important channels it must be admitted, but we must not fail to recognize that they are not the chemical laboratories that the lungs represent. It matters not if all the chemical changes do not take place in the lungs, it is through the lungs that the agents are taken that must bring about the changes; and, after all said and done, it may safely be assumed that

† J. Milner Fothergill, in *Satellite*, February, 1889

imperfect blood depuration is the starting point of ill health, either physical, mental, or moral, for what matters it whether you have a pneumonia or phthisis, or are even insane owing to a cardiac derangement, or are insane from uræmic retention due to Bright's disease, or you are laid out racked with gout, rheumatism, and allied disorders, or are even watching the slow approaches of grim death through the slow process of senile gangrene, with an amblyopia that even robs you of the comfort of reading, and distraction, we must in every case go back to the primary cause, which will always be found to be toxæmia. It is always imperfect blood depuration that is the *fons et origo mali*.

To what fine distinctions, differences in condition of health or disease may be due, after the developmental defect or inherent tendency has once been established, and to what trifling circumstances a person may attribute his particular point of divergence from health, may be inferred from the fact that even in an apartment where the ventilation may be equal in all its parts, a particular form of task may so affect the breathing organism by strengthening or weakening the organs of respiration that a statistical difference in the health of each class will be noticed. For instance, Lombard long ago furnished statistics that showed that the copyist was much more prone to phthisis than the bookkeeper or accountant,* the steady, unmoving work of the former occupation making the difference; the typesetter in a printing establishment is much more subject to the same disease than the pressman.

Another condition of affairs which must not be overlooked in this connection is the fact that the predisposition or tendency-causes do not by any means cease with the departure from the office or work-room, for the better developed muscles of the chest, in the pressman or ordinary and more active clerk, when in the outer air, so work as to more effectually empty the lungs and aerate the blood, while in the copyist and typesetter, as in the mosaic worker, they are weak and undeveloped, and but ill perform their functions, so that even when in the outer air, owing both to lesser chest capacity and feebler respiratory movements, aeration is never as perfect; so that either in the house or out of doors he loses more ground in the physical scale than the other classes. I have purposely taken the extreme illustration, where, however, statistics fully support the proposition, to show that the physiological working condition of the respiratory apparatus cannot all be overlooked, and that all does not depend on sanitary architecture.

There is much in popular errors that helps to bring about our condition of physical degeneracy; for example, people look upon cold as their great and dreaded enemy, whereas cold, unless in an extreme degree, does not and cannot hurt any one primarily. To shut out the cold, which is harmless, they shut themselves up with ochlesitic poisons, as moribund and fatal in the end as the effects of alcohol or fusel oil. They have a vague idea that "catching cold" is to be avoided, but they have not the least idea of the lasting poison of ochlesis or in fomites. A man will give a friend a wide berth during the critical period of typhoid fever, but as soon as that period is passed, he and his whole family will troop into the room, in blissful ignorance of the researches of Uffelmann and others into the wonderful tenacity of life possessed by typhoid bacillus; or, so that they avoid the immediate breath of a consumptive, they live in fancied security. That this infection, as well as that of typhoid and

* L'Influence des Professions sur la phthisis pulmonaire.

other disease germs, is longer lasting in a dark or north room, is not of any importance. The lady of the house, on the departure of her consumptive visitor, will at once draw the curtains and close the windows of her parlor that the light and dust may not affect her carpets and bric-a-brac, perfectly unmindful that the care she bestows to protect these things she may do at the expense of the health and life of a son or daughter; she does not know, nor has she taken the pains to learn, nor has any one undertaken to instruct her, that the bacillus of such diseases as typhoid fever, diphtheria, phthisis, and most diseases which have a specific germ, cannot exist and hold their identity in solar light and air, which, as has been demonstrated by Koch, kills them in from a few moments to a few hours, which leaves no room for doubt that, by the construction of our houses and by the studied exclusion of light and air, we do most for the retention of these disease germs, and at the same time contribute to the preservation of their vitality. I have alluded heretofore to the injury that deficient ventilation does to humanity in producing toxæmic conditions; we now see how the same deficient ventilation tends to maintain germ infection.

It is probably in a bird's-eye view of the many phases that the pathology of phthisis has at different times assumed, and of the various forms of treatment that these changing views have inaugurated, that we see how and wherein the importance of ventilation to life has been so shamefully neglected, how, as it were, in the general advance of knowledge, as in a line of battle, the too rapid advance of one portion has risked the fate of the battle. The study of the etiology and pathogeny of this disease, and the wonderful discoveries of Koch, and the many ideas in regard to its pathology, etiology, or pathogeny that have been advanced here and there, have all absolutely been instrumental in obscuring from us the fact that air and sunshine are its preventives, and that it matters little what therapeutic means we may call to assist—that unless we add plenty of fresh air and sunshine, all our efforts are ineffectual.

We can easily observe the ludicrousness of the appearance of the legs of the Pope's body-guard in their variegated coverings; but we must certainly admit that it is more ludicrous to see a patient going in one direction to have the air pumped out of a cabinet wherein he is to sit, on the Jourdanet idea of an artificial Anahuac climate, and that rarefied air is the proper thing, and another going in another direction to be inclosed in a Pravaz pneumatic cabinet of compressed air where air will be pumped into the cabinet.

It is very evident that Jourdanet failed to grasp the plain truth, in not observing that it is neither the altitude, barometric reading, nor rarefied air that gives the Anahuac plateaus and the Columbian or Peruvian Andes that exemption from phthisis, any more than it is the depression below sea level and compressed atmosphere of the Kirghis steppes, the valley of the Jordan, or of the desert of the Colorado in Southern California, that exempt their dwellers from the same disease—any more than filling the lungs with a gaseous compound by the mouth or the colon per rectum by chemical gases at regular intervals could keep an Indian from having phthisis if suddenly taken from his native plains and housed in an average boarding-house. The Tartar of Kirgheez and the Peruvian Indian of the high Andes need no rubber bag of gas with a rectal tube, microbe-killer, or medicated woollen garments to protect them from phthisis; and the microbe or bacillus that finds its

way into those Peruvian homes—which Americans find so peculiar that people sit in the chilly air with their shawls without having sense enough to close the doors—finds a short existence.

Davis, a former Governor of the British colony in Hong Kong, in his work on the customs of the Chinese, tells us that, among the higher classes, when a visitor arrives, he finds a ventilation in their large and open apartments equal to that out of doors, but that the host has generally a large assortment of furry coats which are handed out something like napkins at an afternoon tea; with his other hospitalities, the Chinese gentleman sees to it that his guest's health is not ruined in his house.* It might be added that the free use of weak and tepid tea, in which they all indulge, acts in no small way as a preventive of uræmic accumulation, for without going to the extent advised by Sangrado in Gil Blas, there is no doubt that many of our people, considering the amount of food they consume, take hardly enough fluid to assist proper blood depuration.

The example of the Chinese in regard to ventilation and hospitality could be ingrafted into our civilization with benefit not only to our health but to our morality. Some may perchance think that with the indiscriminate use of these garments, diseases would be more and more disseminated. This would not be the case, however. In the first place, there would be less diseases; and secondly, Richardson, as already observed, has shown that vagrants who deck themselves out in cast-off odds and ends of clothing, which are often infected, hardly ever receive any harm from the clothes, the sun and air having effectually slain all the bacilli or disease germs. I cannot see why the profession cannot accept the fact that pure air and sunshine are the preventive agent, as well as the curative means, in phthisis, and drop all of those makeshifts with which they torment themselves and the patients, such as the hot-air treatment with which some undertake to circumvent the wily bacillus.

Gout and rheumatism, as well as asthma, owe their origin to deficient blood aeration much more than is generally believed. The classic attack of gout suffered by Sydenham when composing his work on gout, as well as that other attack suffered by John Brown, equally as classical, but more important, as it was the keynote to a revolutionary movement in medicine, and an inauguratory point for the conception of the Brunonian doctrine of sthenia and asthenia, were undoubtedly due to the weakened and imperfect respiration that at the time affected those two beacon-lights of medicine. The English Hippocrates was no doubt absorbed, and writing with bated breath his dissertation on gout; and from Brown himself we learn that he was weakened down and below his normal condition of health at the time.†

Loomis writes, in his edition of "Charcot on Diseases of Old Age," of a Confederate officer in whom the gout was developed by confinement in an unhealthy and damp prison, with insufficient food;‡ and is it not a generally known fact that Holwell, already mentioned, suffered from a severe attack of the gout in one foot a few days after his liberation from the Black Hole?§

*The Chinese, by J. F. Davis, F. R. S.

†Brown's Elements of Medicine, Preface.

‡Wood's Med. Library, Vol. June, 1881, p. 91.

§The Family Physician, Cassell & Co., Vol. IV, p. 971.

I have seen instances of gout developing under similar circumstances, notably the case of a physician accustomed to an out-of-door life, who found himself confined to the bedside of his child afflicted with measles; he never left the little fellow's bedside, and the room was kept closed. On the recovery of his son he suffered severely from his first attack of gout. Although his family has no gouty or rheumatic history, they being long-lived, hearty people, one week of close air developed a disease that may require generations of careful watching and pure air to eradicate from the family should he have any more children.

On the other hand, the case of the rich and gouty old priest, observed by Van Swieten, and mentioned by Fothergill in his work,§ is very instructive. Here was a cheerful old gentleman of the old school, a good liver, who took but little exercise, well fed, and taking his after-dinner naps in a room carefully closed to exclude the heat and flies of summer and the cold of winter. We may rest assured that he used his respiratory muscles but to very little purpose, probably never taking a deep respiration, unless after his social pinch of snuff with the burgo-master, which undoubtedly induced a healthy sneeze. His capture by Barbary pirates, who took no stock in full meals and after-dinner naps in close rooms, cured him of his gout; the fresh sea air and the deep inspiration required properly to propel a galley oar furnished a medium through which a complete oxidation of the urea took place, and an efficient exhalation of all toxic material.

Professor Marfan, of Paris, has related the occurrence of what might plainly be called an epidemic of phthisis, where one consumptive in an atelier, by promiscuous spitting all over a rough floor, so managed to infect the rest of his twenty-two fellow-workers that in six years after his own death they began to die rapidly, until fifteen out of the twenty-two were gone. Marfan and Vallin laid the blame on the character of the floor and the sputa infection; the old floor was removed, the apartment disinfected, a new, well-jointed, and smooth floor laid, and the epidemic ceased.* Cases like the above, but not so extensive, are common enough to make us feel a wholesome dread of the bacillus, regardless of what contrary opinion others may hold, and founded on ever so many experiments. But this does not alter the fact that we have depended too much on the bacteriological origin of phthisis. Where one person becomes phthisical through the bacillus, there are a dozen that have become so without coming in contact with it. And while in our zeal we have pursued this branch of our science, we have closed our eyes to the fact that deficient ventilation is the most prolific source of phthisis, regardless of the presence or absence of the bacillus. We are getting to depend altogether on the bacillus, which, like Falstaff's men in buckram, is multiplying and fast becoming the cause of every form of disease.

Another incident wherein the bacillus is made to usurp deficient ventilation as the cause of a disease, is the lately discovered fact that a bacillus has been recently found in connection with trismus. To attribute the origin of trismus to any bacillary cause we must altogether ignore all that we know of the disease. If the literature on the subject were scanty, or obscure and indefinite, and the observer incompetent, and our experience in its connection inconclusive, we might begin to doubt; but such, however, is not the case. The literature is very intelligent,

§Gout in its Protean Aspect, p. 164.

*Boston Med. and Surg. Jour., Vol. 122, No. 18.

authentic, and exact on the subject. The work by John E. Morgan, F.R.C.P., entitled "The Diseases of St. Kilda," devotes much intelligent explanation to the cause of trismus. Morgan was a close observer, and noticed that the disease did not prevail on the neighboring Hebrides. In his search for a cause, he observed that a like equable, mild climate affected St. Kilda and the Hebrides, but he noticed further that while in the latter islands the inhabitants live in the Scotch bothies, such as are found on the Scottish coast, built of loose rock and stone, with plenty of crevices and an open chimney, those of St. Kilda were built of rocks, but closely cemented at every joint; and that although, as in the other islands, a peat fire is used, the cottage or hut has no hole for the escape of the smoke. On inquiry he found this difference in custom to be due to the scarcity of seaweed on the St. Kilda shores. On the Hebrides, either owing to different winds or ocean currents, the weed is plentiful, and is used for manure, while at St. Kilda the soot that has gathered on the walls and under the roof is scraped off in the spring and used to enrich the fields. To allow this soot to collect the house is kept carefully closed. Doctors Morrison and Maxwell, who practiced in the West Indies, attributed the existence of trismus in those islands to the confined and smoky condition of the houses. The same may be said of the negro huts on the Florida and Georgia coasts where trismus has been observed, and lastly, the experience of Joseph Clarke, and subsequently of Collins, in the Dublin Lying-in Hospital, where by continually improving the ventilation the trismus epidemic was checked, would seem sufficiently to prove the foul air origin of the disease.

On the other hand, it must not be overlooked that want of ventilation will engender very infectious and contagious diseases. Dr. Parry, in discussing other subjects, says: "It may be stated, as a general proposition, that all living bodies, when crowded together, generate a matter which would seem to be highly destructive. No species of animal can congregate in ill-ventilated apartments with impunity. Under such circumstances, the horse becomes infected with glanders, fowls with the pip or pep, and sheep with a disease peculiar to them, if they be too closely folded. It is worthy of remark that these diseases, evidently engendered by congregation, become subsequently contagious. In the expedition to Quiberon, in 1795, several transports, crowded with horses, had their hatches shut for a considerable time in a storm, by which some of them were suffocated, and amongst the surviving horses the contagious disease called glanders was propagated. At another period it was proposed to send livestock from England across the Atlantic, but the animals all died of a febrile disease in a few weeks, in consequence of being too much crowded." From this we may readily see that the ill-effects of unventilation are more far-reaching than generally believed, and we can as readily perceive how the same cause may engender serious organic disease in men. Furthermore, we cannot escape the conclusion that it is not alone the individual sufferer who may be the victim, but that a violent contagious or infectious disease may, from such a small beginning, nearly depopulate some countries. Asiatic cholera but too often has such a possible factor.

Maudsley has well said that the mind is the most dependent of all the natural forces, and that for its existence all the lower natural forces

are indispensably prerequisite.* The time has gone by when the mildly lunatic was tortured, hung, or burned at the stake as a criminal, while the phrensied, raving maniac was either chased about like a wild beast or considered as a demoniac and deluged with holy water and prayer. Pathology has here opened up a study that has not yet fully brought out all its fruits. Liver abscesses, or empyema, is now known to derange the mind as much as we realize that intestinal irritation will produce night terrors. Readers of Silvio Pellico's "My Prisons" will not forget his graphic description of the hallucination that he suffered while confined under the "leads," or leaden roof, of the ducal palace at Venice, finally relieved by what must have been the spontaneous discharge of an abscess into the intestinal tract, when all the mental disturbances at once left him. It is also a recognized fact that uræmic retention holds a very close relationship to insanity, Dr. Alice Bennet showing, in a paper read before the Pennsylvania State Medical Society, the connection between it and Bright's disease.† The connection between the habitual or excessive use of stimulants and the development of insanity is too well acknowledged to require more than mere mention, except that we may add that it is among the lower classes who use the excess of liquor that we find the greatest amount of lunacy, and observe further, that which has been more than once suggested in the course of the paper, that by insufficient analyses of our subjects we oftentimes connect and mingle coexisting effects as cause and effect, and often place a result as a primary cause. In this respect we must not forget that among the poor there is an inherent tendency to infirmities, mental and moral, as well as physical—a condition due to the deterioration caused by want, lack of proper nourishment, anxieties, suffering, and lastly, but not the least, the foul air which they must of necessity continually breathe. Liquors and stimulants are the causes to which all the miseries and physical as well as mental afflictions of the poor are attributed—as if poverty itself were no misery, and did not carry in its train sufficient ills aside from the use or abuse of alcohol! The premature mortality so excessive with the poor, their ailments, feeble-minded, rachitic, or consumptive children, depravity, moral degradation, idiocy, and insanity—in fact, all that may happen, either in the line of physical or of moral degradation, is attributed to alcohol. Alcohol with them has become a necessity, owing to the morbid condition induced by foul air.

A reviewer of Acton's work on prostitution mentions the swarms of child prostitutes that infest the low quarters of London, whose existence he attributes to a "brutal stupefaction of the moral senses, resulting from an utter ignorance of what is good or evil." Were I to review the reviewer, I might ask how ignorance can cause brutal stupefaction of the senses, either moral or otherwise. In the present age, we fully understand that for all effects there must be a specific, self-sufficient cause. It may not be found at once, but we should neither jump at a conclusion nor cover our ignorance in the matter by a mere figure of speech. Saying that their mothers drank alcoholic liquors, and that precept and example have lowered and debased them, even if they are too young to have drank themselves, does not satisfactorily explain the existence of the swarm of child prostitutes, or how they arrived at the stupefaction of the moral senses. My own opinion is, that on alcohol

* Maudsley. Physiology and Pathology of the Mind.

† Med. News, Oct. 4, 1890.

we lay the blame so that we may not blame ourselves for the indifference and neglect of the human family in our immediate neighborhood: it is a certain relief to the conscience to say that they drink—drink has brought it all on them: we then wash our hands, like Pontius Pilate, and the Passion Play goes on. Drink, however, does aggravate and precipitate many conditions that the poor have in them with a strong inherent tendency. Every practitioner knows that among the children of the poor, living in crowded tenement houses or basements, there exists a disposition to convulsive and nervous diseases, as well as that they are more subject to zymotic diseases; and that, too, where the parents are habitually sober. Nearly every physician who has had such practice has often wished for the wealth of a Vanderbilt or a Jay Gould, that he might relieve the poor, patient, anæmic little children who seldom see any joy, and who seem from birth wedded to a life of misery. The question has often occurred to me, while looking on these helpless children, is it possible that the philanthropist and statesman are unacquainted with the effects of foul air? That such an air, which will give an ordinary gentleman, accustomed to well-aired rooms and fresh air, a headache that will last him all day, or even produce in such a man an illness, must be poisonous, no one will doubt.

In a concentrated accumulation this foulness has shown serious results besides the Black Hole and other such episodes. Guy, in his work on Public Health, quotes from Sir John Pringle, in connection with the work of the philanthropist, John Howard. He there relates that in the May sessions of 1750, at the Old Bailey, forty persons perished from putrid fever, caused by breathing the foul air that issued from the jail-room and prisoner's dock; of this number, four were Judges, and the rest officers, barristers, and jurymen. That was an extreme case; but I have often visited sick children in rooms and beds, where between the fumes of cooking, the over-heated room, and the steam from drying clothes, added to the exhalations of half a dozen large-lunged human beings, the room was so offensive that I made my visits very short. This air has precisely the same effect as alcohol or fusel oil, and the slow, steady effect on the nerves of the susceptible little child is to create a morbid irritability which later calls for alcoholic support. The little bodies of these poor children have no more resistance, strength, or endurance than their little brains; they are morbidly sensitive, and age early; want has developed a precocious sharpness of instinct, and the foul air that has poisoned their young blood has precociously matured their sexual organs, while the rest of their physique lacks development. Foul air is more than sufficient to cause all these conditions without the assistance of alcohol either in the child or its parents. It is the foul air that produces that "brutal stupefaction" of the moral senses before alluded to. In one London parish, out of eighty little girls raised in its work-house, seventy-nine were afterwards found, on an investigation, to be on the street,* and Dr. C. F. Taylor relates that in one New York asylum for feeble-minded children, fully two thirds of the children masturbated, the proportion being about equally divided between the sexes. By careful investigation it developed that among these feeble-minded children the habit came by intuition—the morbid excitability of the sexual organs being the cause—without assistance from either precept or example. The girls were found to begin at the age of eight, and the

* A Home for the Homeless, by the Hon. Mrs. Wray.

boys at ten.* Society and the State furnish millions for the suppression of the depraved class, when a tenth of the sum would effectually prevent its formation.

The unnamed author of a remarkably instructive little work† on ventilation in its relations to life and disease, makes the following true observation: "The combined testimony of those who have taken the pains to investigate the causes of vice and prostitution leaves no doubt that a low condition of body and mind, coincident with a morbid irritability of the brain, so far from restraining (as might be surmised) the animal propensities and vicious inclinations, has no inconsiderable share in their aggravation and production." The effect of foul air on the brain has been well depicted by James Johnson, in connection with the death of Mr. Justice Hays, who was stricken with paralysis and apoplexy after a day's sitting in the foul air of a court-room. "The blood," observes the doctor, "imperfectly aerated, and charged with the exhalations from numerous lungs breathing the same atmosphere, is impeded in its passage through the minute arteries, whose muscular walls contract and hinder its progress. Hence the sense of fullness, pain, and throbbing in the head, while the heart beats with increased force to overcome the impediment and to drive on the blood."‡

Dr. Johnson's labors in the field of renal diseases are well known, and he explains in the above the cerebral action of impure blood, a subject with which he is perfectly familiar. It is preposterous to imagine that the delicate brain and nerves of a child can stand the continued effect of such a poison without harm; and civilization can only plead ignorance as an excuse for its sin in the way of omission, in thus neglecting the child and allowing it helplessly to grow up food for the jail or the gallows. Were the clergy to study physical causes and effects more, they would see that the first principle to be instituted to obtain a moral man is perfect sanitation, without which all mission work and sermonizing might as well be made to the four winds.

As a summary of what has been advanced in the foregoing paper, it may be stated that it has undertaken to show that the visible point of departure from a condition of general good health and an unimpaired organism is plainly where the nomad diverges from the free, out-of-door life of his ancestors, and incloses himself within four walls and a roof that exclude the sun and air, and retain his own exhalations. Prior to this occurrence we can find no history of developmental organic defect—neither inherent tendency in any organ or part to disease, to morbid irritability of body or mind, or tendency or liability to reflex troubles of any kind. That ventilation is the prime factor that induces this wonderful moral and physical perfection by allowing the aeration of the blood to be fully carried on as the Maker intended, is evident from the fact, as cited by Hirsh, that there are populous industrial centers on the high plateaus of the Andes, cities of from twenty thousand to three hundred and twenty thousand inhabitants, where the bacillus tuberculosis does not seem to thrive or find a lodgment; so that mere density, industrial pursuits, or civic aggregation cannot be said to be the cause of the physical degeneration observed elsewhere. The secret of the exemption in these communities is found in the simple fact that either in August

* Am. Jour. of Obstetrics, Jan., 1882, p. 163.

† House of J. S. Redfield, Clinton Hall, N. Y., 1849.

‡ London Lancet, Dec. 11, 1869, p. 824.

or January the thermometer marks 60° F.; that their houses are never closed at any time; if they feel chilly, they simply put on an extra shawl or poncho, *but they do not close the door*. It may also be stated that these localities are not financially drained to maintain swarms of idiots, lunatics, rachitics, crippled paralytics, criminals, or prostitutes, either in reformatories, asylums, hospitals, or jails. Such are the facts, and we can draw our own inferences. One thing is certain, that these people literally live out of doors.

The erroneous opinions of the public in regard to the effects of good or bad ventilation have next to be considered. That ventilation does not receive the consideration that it deserves from the public, is undoubtedly due to the reason that they misapprehend the really dangerous element that lurks in non-aerated rooms; further, they lack the appreciation that there exist gradations in effects proportionate to the causes. They can, as a rule, only appreciate extremes of conditions. That each intermediate fraction of space between a sane man and a phrensiated maniac can be accurately filled by a specimen representing each gradation cannot be understood by them, any more than that one gradation leads to the other. Neither can they understand why there should be preparatory processes to the inception of a diseased condition. When the poor consumptive asks you simply to give him something for his pain in the chest, or to stop the cough, or to arrest his night-sweats—it is all that he wants; stop that and he will be all right—it fully shows the popular idea of disease and the popular appreciation of the processes through which the body must pass to reach certain stages or conditions. It cannot be said of them, as the French said of the returning aristocracy in 1814, "They have learned nothing, but they have also forgotten nothing." Through civilization our people have learned nothing of benefit to their health, and they have lost that instinct for fresh air so dominant in nomadic tribes. Oswald relates that when the Circassian chief Shamly-Ben-Haddin was captured by the Russians, in 1864, he offered his captors the best part of his rations and all his personal valuables for the privilege of sleeping in the open air, feeling that one week more of the nausea and headache consequent on his sleeping indoors would drive him to suicide. General Houston, who spent his life among the Cherokee Indians, never could endure a close room or a crowded hall for more than a few minutes. As our people have forgotten or lost these instincts, they should be instructed as to their danger. With no knowledge or instinct in so important a matter, it is not surprising that they so often come to grief.

There is no reason why they should not understand that the strength and endurance, health and expectation, of life must be measured, like a chain, by the weakest link, and if that one organ be enfeebled, the apparent health and strength of the other only hastens the destruction of the whole, for, as George Murray Humphry observes, it is requisite to longevity that "each organ must be sound in itself, and its strength must have a due relation to the strength of the other organs. If the heart or digestive organs be disproportionately strong, they will overload and oppress the other organs, one of which will soon give way. One disproportionately feeble organ endangers or destroys the whole."* If the laity could be made to realize that between lasting and enjoyable health, and sickness and lingering misery, there is but a shallow and an almost

*Humphry. Old Age.

imperceptible Rubicon to be crossed, whence there is no returning except on a compromise made by running the whole machine on the basis of the weakest organ, and that one hour spent in a close room may be to them that Rubicon, much more attention would be paid to the importance of ventilation. The writer has seen, more than once, a child born perfect and sound, but one half hour's overheating in a close room, by an over-solicitous nurse, produced a nasal stenosis that has followed the child into adult life, with the anæmia and all other ills that accompany such a condition of affairs, changing the temperament and constitution completely from what it would otherwise have been. Ventilation will not exempt man from all things; but, from a careful consideration, it is safe to assume that if all the ills that deficient ventilation does create were eliminated, the remainder would require but little care.

Hippocrates gave us air, water, and locality, as the three ingredients of climate. Angus Smith gave us the chemistry of climate, which analyzes the quality of the air. After many excursions and exploring expeditions in search of something better, we are gradually drifting back to our old friends' way of thinking, and we are now as convinced of the uselessness of climatic classifications as we are of those of drugs or diseases; in fact, we have found out that the many pursuits and side studies, researches and discoveries, have, through our zeal, led us somewhat astray. Sydenham, Heberden, Boerhaave, Tissot, and Rush all tended to a greater observance of nature, and tended more to treat the individual man than the individual disease; the latter they generalized more than we have done. Beale, Thompson, Fothergill, Johnson, Hutchinson, Black, and Richardson have so far advanced beyond the beaten path that medicine has trod during the last sixty years, that they recognize a great fatherhood to our ills and pains in one great standing and distinct point, this being where perfect depuration ceases and where imperfect blood depuration begins. It is this that marks, as it were, the visible line of physical differences as a mass between the nomad and the civilized man, and its cause is in a free or an imperfect ventilation. The limits of this paper will not permit a dissertation on all the remedial measures that should be instituted to relieve the evil conditions pointed out. Were it practicable to reestablish the old Spartan tables of the Lyncurgan system—with its black broth, bread, olive and fig banquets, and with it the iron money—it would at once sweep free the coming generations from the cursing evils that affect the present one in a fast increasing ratio. It would not only benefit the poor, whose blood is impoverished by too innutritious food, and who are poisoned by foul air, but it would equally benefit the rich, as the bill of fare of the Lyncurgan board tended not to induce diseases due to plethora or uræmia; but it is useless to dwell on such an Utopian prospect. Chauncey Depew and Ward McAllister would put their foot down on any such proposition. Were people less touchy about the question of interference with their immediate personal rights, the opposite of the method suggested by Dr. Lindley of Los Angeles, at the last meeting of the State Medical Society—that of castrating all male criminals for the extirpation of the criminals—might be adopted, this being the removal of the ovaries of every intemperate woman; there would be one advantage over the method of Dr. Lindley, in this: there would be no chance for a mistake. As the old French detective proverb went, when they were in

search of a criminal, "Get hold of the woman, and you will soon catch the man." According to Dr. Lindley's plan, the wrong man might be operated on; but as no intemperate woman can carry a child for nine months, while she is in a state of inebriety, without affecting the child, and as in the choice of sexual selection some otherwise very good men are so terribly careless, I feel that, were it practicable, this would be the best way to extirpate the class. This, however, cannot be done. But there is something that can be done: intemperate women should not be allowed under any circumstances to suckle children. A child would run much less risk, in the first place, by being raised by hand; and, in the next place, its future welfare would not be jeopardized either physically or morally.

In this connection I cannot help mentioning the grievous injury inflicted on children who are put out to wet nurses, by the parents' furnishing beers and liquors to the nurse that she may give a more copious supply of milk. As observed by Griesinger, insanity or mental conditions are formed in their germ at very remote periods from the time that the actual disease appears,* the generally supposed real causes being only the precipitating or determining causes. Failure in being able to provide is generally in a popular or legal sense limited to the question of a sufficiency of food and clothing to keep body and soul together. The State should recognize this failure in a broader sense. The father of a family may be able enough through his labor to provide ample food and clothing, but too poor to provide proper air. The child may live, but so warped physically or mentally or morally that it were better dead. Food and clothing are not the only necessities by any means. They may be like the last meal of a condemned man—sufficient to give him strength to mount the scaffold. The State should recognize fully the effects of foul air on the children, and make it a necessity that they should have fresh air. To this end it should assume the charge of these children. The Spartans, as well as the Indians of Southern California, took charge of *all* the children, thereby assuring the community that they should suffer neither through want nor self-indulgence, to the evident benefit of their physical and moral welfare. Our civilized communities should certainly have charge of the children of those unable or unfit to care or provide for them. We do not treat the domestic animals so thoughtlessly. A horseman would be shocked to see a thoroughbred colt in a foul and unventilated barn, or feeding on deteriorating food. His instincts for the welfare of his loved animal would even probably induce him to pay double his price, if required, to save a noble creature from losing that physique, intelligence, courage, and endurance that belong to him, and to keep him from degrading into an old hack or common horse, just as philanthropists of old devoted all their earnings and fortune to the purchase of Christian captives from the Algerine corsairs. The same spirit cannot all be dead. Our philanthropists and statesmen should fully and thoroughly comprehend the dangers and situation of these children, who, in the long run, will otherwise only grow up to be the *chair a canon* for our charitable or penal institutions later on. In taking charge of these children, it should be the aim of the State, not only, as unfortunately it is done now in unavoidable cases, to provide a charity home or mere resting place, but it should use its endeavors toward their physical, mental, and

*Griesinger, Ment. Path. Wood's Med. Lib., 1882.

moral education, as it does to its soldiers, from whom it expects future service. They should not be treated or made to feel as paupers, but as children only receiving their dues and from whom the State expects future recompense, just as the future horse in time will repay his keeper and trainer for all his kindness and care, as depicted in the winning horses of Ben Hur in the chariot race, where former kindness, good treatment, and training show good results. All this is not as Utopian as it is barbarous, cruel, and unchristian to neglect it. Where a gentle, weak woman could have guided the child aright under proper hygienic surroundings, we, in after life, turn the world upside down with swarms of detectives, at a tremendous expense, to hunt down the same being who, through unhygienic surroundings, has been converted into a vicious, determined criminal, that the majesty of the law may be vindicated.

We might better begin early, and, by surrounding the little helpless human being whom a cruel destiny has intrusted to keeping that is not of its own choosing, with better hygiene, better precept, and better example, vindicate the majesty of our enlightenment, civilization, manliness, and Christianity. These poor children never know either childish innocence or childish joys; for them there are not in after life those memories of childhood to soften and make them better, for they have had no childhood; they have prematurely aged in every sense, and the struggle for life, in all its bitterness, has been pressed like a full cup to their helpless little lips when scarce out of infancy. No wonder that the low quarters of our great cities swarm with multitudes of prostitutes scarce out of childhood, and that a brutal stupefaction has in them overcome all moral sense—a moral sense that might be said to be stifled at birth, for it requires a pure and uncontaminated atmosphere for this to thrive—something which the poor child has never enjoyed.

As observed in relation to the interpolation of various branches of science in their effect in obscuring from our view many of the simple truths of medicine, and the suggestion that we retrace our steps to spots where we know a sound foundation exists, so we may well remark to our kindred profession, they of the cloth, that if they were to have less theology and more practical, Christian common-sense, it would be better for the ends that they profess to wish to reach. It is not beyond their province, as the Mosaic law is full of examples. If the great Master was not above realizing that the welfare of his chosen people greatly depended on their physical condition, his followers should not consider it beneath them to follow his example; if the Mosaic teachings could notice even such trifles as the need of the proper aeration of the excreta of the multitude crossing the desert by the aid of the dry, powdered earth, our present shepherds should not be slow in recognizing the same facts, but how much more urgent by reason of our greater density and stability of population. The pulpit, like medicine, is losing much of its usefulness in rhetorical flourishes and figures of speech. When the great Master was asked the road to salvation, he pointed neither to shelves of theological lore nor to a collection of tracts on the ethics and ceremonials of religion: his answer was of few words.

The road to health is equally as simple. Hufeland pointed it out in what might be boiled down to a very few words: Breathe pure air; an equable climate; don't worry; and don't eat or drink more than you need. Conditions in the air that favored free ventilation were the pre-

requisites with Hufeland, Sydenham, Rush, and those of that class who may be said to be canonized and sanctified in the heart of our profession.

The space of this paper will not permit a discussion of the mechanical means. The literature on the subject is ample. Billings, Leeds, Eassie, and the hygienic works of Buck and Parker, are about complete on the subject. The enlarged edition of the lecture delivered by Leeds in Philadelphia is a short treatise devoted to the elucidation of one system of ventilation.

Some six years ago, while preparing a lecture on ventilation which was to be delivered before a meeting of the Teachers' Institute at San Diego, I prepared a small wood and tin framed house, with tin chimneys and glass sides and roof, which I used during the lecture. This was done on the Leeds system, with the aid of small lamps for fires and different lengths of lighted tapers to represent persons—manufacturing different atmospheres that were introduced into the house. This gave me such a good opinion of the system, that I afterwards incorporated it in a residence I built, and have every reason to be well pleased with it.

Before closing, it would be well to suggest that ventilation is not by any means always health, or even life. An intelligent supervision and understanding are here absolutely necessary. The four Judges and thirty-six persons who died of putrid fever contracted at the Old Bailey, were those who sat in the best ventilated part of the room, *but right in the track of the foul air as it was making its exit from the room*. Here ventilation, by its unintelligent observance, made deaths. These are the cases already mentioned as quoted from Sir John Pringle by Guy. Hartley quotes an apartment in a London house which was all right unless a fire was lit in the fireplace, which then ventilated the room. On investigation, it was found that the suction caused the filtering of air through a side wall, and that in contact with this wall there was an old dust bin, which accounted for the bad odors in the room as soon as the fire caused a current up the chimney.* So that evidently great care must be exercised over the source of the ventilation.

Aside from the above, it must not be overlooked that a whole locality, or even a city, may at times be so imperfectly ventilated as to be dangerous to life. Considering the extent of the broad canopy of the heavens and the miles of extent of atmospheric air, this may sound hypothetical and impossible, but it has nevertheless occurred.

In the second week of December, 1873, the city of London was visited by one of the densest fogs it had ever experienced. The free escape of the smoke and the proper diffusion of gases were so materially interfered with, that all the emanations from the thousands of smokestacks, chimneys, and its millions of lungs and all other sources of effluvia, were necessarily prevented from being dissipated, and were retained either in the houses or on respiratory levels.

The result of this condition is well seen in the Registrar-General's report, which shows that this state of the metropolitan atmosphere was not only the means of causing an enormous death-rate, but was also the means of producing a large number of premature labors as well, for the returns gave, for the week ending December 20th, one hundred and eight more births than the average number, and seven hundred and eighty more deaths than there had been for any one week in the previous ten years, after making all due allowance for the increase of population.

* Hartley. Air in its Relations to Life.

That it was the atmospheric condition that induced these morbid changes may well be believed, from the fact that from the London "Times" of the 11th and 12th of that month (the fog occurred on the 9th and 10th) we have an account of the doings of the "Smithfield Club Cattle Show," then in operation. We there learn that the show was interfered with by the sickness and mortality among the animals, many of whom were only saved by being hurriedly sent out into the uncontaminated air of the country. What foul air will do can well be surmised when the Registrar-General's report shows that the mortality of the week above mentioned far exceeded the mortality of the cholera week in the fall of 1866.

A proper realization of the fact that man was not built so that he should respire about twenty times per minute for amusement or luxury is evidently the last thing that strikes the laity. How far in different directions this total disregard of what nature has intended has affected us injuriously is not appreciated, any more than does our profession realize the harm that results from our attributing therapeutic effects to agents here or there, when the results are purely to be attained by a strict attention to the condition of the first and main element of the Hippocratic trilogy—air. This is well exemplified on the Italian Riviera, where the north German or Russian comes for *the climate alone*, but is so utterly indifferent to the quality of the air that he breathes, that, by the means of the box stove of the fatherland and the liberal use of caulking material industriously inserted wherever a crevice might allow the ingress of a little fresh air, he converts as nearly as possible the condition of the air of his apartment to that of the air he left behind near the far northern Baltic shores.*

With a proper appreciation of the many propositions set forth in this paper, we would have far less to contend with against quackery, as, by a better realization of the causes of disease, the laity would be lifted out of the narrow and contracted limits they now occupy in their belief in the wonderful efficacy of this or that drug, or in their insane worship of the many "isms" that disgrace the field of medicine, and which have nothing but the ignorance of the otherwise better informed laity for a stable foundation. The subject is one of the deepest interest to all, but one that the patriot, the philanthropist, and the statesman cannot neglect, for it has been said that the race which has the strongest vitality and the longest resistance to decay and death must in the end become dominant.†

The day may not be far distant when the State may need that its citizens shall all have healthy physiques. Without being unnecessarily alarmists, we cannot wholly shut our eyes to the fact that to the west there exist a horde of semi-barbarians, numerically infinitely superior to our nation, who live in a far less productive country, and who are lately making rapid progress in all that is advantageous in European civilization, and who are also fast adopting all the recent advances in the art and systems of warfare. Like to the ancient Briton, we have called these *outré-mer* barbarians to our shores, and have made them acquainted with the greater fertility of our fields, our more genial climate and richer mineral resources, and our more desirable food supplies. We have been obliged to resort to law enactments and diplomacy already, to curb

* Bennet. Pulmonary Consumption.
† Richardson. Diseases of Modern Life.

the migratory impetus that all this knowledge has caused. Diplomatic fencing generally precedes that of the sword: it may be a long or a short interval, but the latter extreme is reached sooner or later. England has Australia, South Africa, and her immense Canadian possessions as a resort for her superfluous population; Germany, France, and Italy have not so great an excess beyond their power to support but that it imperceptibly filters into the United States, to become incorporated as part of our population; but China does not amalgamate, nor has she a locality for her overflow. So that not only as philanthropists and as Christians do we owe something in the shape of fostering care to our poorer brother, but as statesmen we must realize that the poorer brother is really the strength and supporter of the nation, and that in time of need he is its real protector.

As a remedy to all of the above possible evils, which are not alone probable, but are even now actual, daily occurrences, I would suggest a little more attention to matters of practical importance when a house is being constructed. If one tenth of the attention that is paid to the proper *outer* appearance, as to the disposition of gables, windows, gim-cracks, and gingerbread work, or to the devising of bewildering and blinding fantastically colored windows, were given to placing the house in a proper sanitary condition as regards ventilation, mankind, society, and the State would all be the gainers. As it is, however, most persons, knowing very little about ventilation or its benefits, or of the risks they and theirs run through unventilation, but little attention is paid to it, and necessarily and naturally no importance whatever is paid to the matter.

Many people foolishly imagine that, because they open their rooms to the air for a few hours daily—when the winds, dust, rain, or outside temperature does not interfere with their doing so—that they have complied with all the requirements demanded by health or by the body. The proper time to ventilate is when you are at home, and especially when the process of reparation are most active—this is when you are asleep. Then, again, the laity, by an erroneous conclusion they have somehow arrived at, have formed and cultivated the habit of carefully and hermetically housing the very classes that need all the benefits of ventilation the most—these being the young and very aged. The latter, especially, should be in well-ventilated apartments, especially if any young children are with them.

Very few of our school houses are built or constructed with any view to ventilation, except *outside of school hours*. During the time that the children are in school, ventilation has to take "pot-luck" chances on an occasional opening door. I have, at times, entered the room in school houses that have cost as much as \$35,000, *half an hour* after the departure of the children, and although the windows were opened *after school*, the offensive odor peculiar to animal effluvia was still very disagreeably present. And yet the School Boards of the city thought that they had well done their duty by the children and the citizens. The children with headaches and other derangements arising from poor ventilation that I have individually treated, show but too well the effects of a foul air. The architect did make a *pretense* at ventilation, but that was all that was really accomplished.

All public buildings, of whatsoever sort or for whatsoever purpose, should only be constructed under strict inspection, and after the approval of the plans by a Board of competent sanitarians, composed of men

skilled in sanitary construction and engineering. The slipshod way in which these affairs are now managed is unworthy of the nineteenth century, and of a nation that should set a better example. The schools above mentioned are but nurture beds for neurotics, and are as deficient, so far as their sanitary condition is concerned, as any building can be that is only ventilated when it is unoccupied. A building which is only ventilated at those times, can in no sense be termed even passably perfect in any hygienic sense.

One great drawback to properly ventilating buildings I find to consist in the fact that they are constructed with an utter disregard to the requirements of climate, either in the material used, exposure of building, and the attempt to mix up the means of lighting with those of ventilation—something which should be entirely separate. This utter disregard of climatic conditions cannot always be made with impunity, and I have seen various and ineffectual attempts to introduce some very primitive and impractical system of ventilation into public buildings some years *after* they had been in use; one of these being a Masonic hall and the other a court house. Had these been school houses, the utter want of ventilation would not have been noticed, as teachers are supposed to be in a normal condition if with headache and a backache, under any and all circumstances, and children very seldom complain; but in the event of any sickness, epidemic, or the critical period of existence in a girl's life, the want of ventilation, from which the system has suffered, is then very plainly discernible.

I would make it as a suggestion that no building for public use, be it church, theater, hall, school, or hospital, nor administrative buildings for State, county, or municipality, be constructed or allowed to be constructed until its plans are submitted to and approved by a competent Board of sanitarians. I would even go further—as it is a well-recognized principle that cities require "lungs," or parks, and commons, not in the suburbs, or outskirts, but in their most populous places—that no one should be allowed to plat out a town, designed for the congregation of a population, without said plat being also submitted to a like competent sanitary Board for examination and approval—as the relation of the lay of the streets to compass points and the prevailing winds, and the proper laying out of alleys, and parks, width of streets, as demanded by the latitude, and regulation as to height of buildings, and all matters that affect the health and length of life of its future dwellers. It seems as if it were the height of absurdity for a city to have to contend with the work of marplots and botches for centuries to come, when it should not have been allowed to start wrong in the first instance. The simple fact that we are a republic, is no reason for such irrational and primitive methods. Old European cities and towns are now at great expense undergoing the haphazard and marplot work of the middle ages, and it would seem as if we might at least profit by their example, and not perpetuate tenth or sixteenth century blunders, which, I am very sorry to have to remark, is precisely what we are doing.

The State, county, and municipality must first set a hygienic example on these matters, and the supervision must further be carried into the construction of all public buildings. From these starting points the good work will reach the villa and the cottage, and we will then be better morally as well as physically. These are matters that should occupy the minds of our statesmen. It will lessen the needs and expense of penitentiaries, reformatories, jails, asylums, and hospitals.

SANITARY LAWS OF THE STATE OF CALIFORNIA.

POLITICAL CODE.

PART III—Of the Government of the State.

TITLE VII—General Police of the State.

CHAPTER I.

IMMIGRATION.

- SECTION 2952. Lepers, lazarettos for.
 2955. Examination and disposition of lepers. Fees.
 2959. Fines and penalties, lien on vessel.
 2960. Other commutations.
 2962. Certain vessels exempted.
 2966. Ex officio Commissioners.
 2968. Bond of Commissioner.

SEC. 2952. It shall not be lawful for lepers, or persons affected with leprosy or elephantiasis, to live in ordinary intercourse with the population of this State; but all such persons shall be compelled to inhabit such lazarettos or lepers' quarters as may be assigned to them by the Board of Supervisors of the city or county in which they shall be domiciled or settled; and the Board of Supervisors are vested with power and are required to make all necessary provisions for the separation, detention, and care of lepers, or persons affected with leprosy or elephantiasis, settled or domiciled in their respective cities or counties. The Superintendent or manager of all lepers' quarters under this chapter shall forward quarterly statements, showing the name, age, sex, and birthplace of each leper in such quarter, to the Secretary of State, who shall keep a proper record of such matters for the information of the public. [In effect March 25, 1876.]

SEC. 2955. The Commissioner of Immigration must satisfy himself whether or not any person who shall arrive in this State by vessel from any foreign port or place is a leper, or affected with the disease known as leprosy or elephantiasis, before such person shall mingle with the population of this State. For the purpose of ascertaining said fact the Commissioner is vested with the power and authority to detain such persons on board any such vessel so arriving, and to assign the vessel to a berth or anchorage separate and apart from other vessels, and at a safe and suitable distance from the shore, if in his judgment it shall be necessary, until such fact can be fully ascertained by him. Such fact shall be ascertained by personal inspection and examination of each and every person on board such vessel; and the Commissioner of Immigration is authorized, empowered, and required to make such personal inspection and examination of all persons so arriving by any such vessel, the same to be made at such berth or anchorage as he shall, in his

discretion, assign to such vessel for that purpose, and shall be made before the landing of any person thereupon. All of such persons who, upon inspection and examination, are found to be lepers, or affected with the disease known as leprosy or elephantiasis, shall be taken in charge by the Commissioner of Immigration, and placed in a suitable lazaretto, or lepers' quarters, to be provided or designated by the Board of Supervisors, whenever necessary for that purpose, as hereinbefore prescribed, and there detained and properly cared for, separate and apart from the general population of this State, so long as they, the said lepers, shall elect to remain in the State of California, or until they shall have recovered from said disease, and no longer. All of such persons as shall be found to be free from said disease shall be allowed to depart and go at their will, without unnecessary detention or delay, and shall be entitled to receive a certificate of the fact of their freedom from said disease from said Commissioner. For his services in making such examination and inspection the Commissioner of Immigration shall demand and collect from the master, owner, or consignee of such vessel the sum of seventy cents, in United States gold or silver coin, for each and every person so examined or inspected, which sum, except four thousand dollars a year and expenses of office, shall, when required for such purpose, be paid by the Commissioner into the State Treasury, to be used in the maintenance, when necessary, of such lazarettos or lepers' quarters as shall be constructed under this law. Any master, owner, or consignee of any vessel arriving at any port of this State who shall fail or refuse to perform, or permit the performance of, any of the acts or things required by this chapter, or to take and occupy with his vessel the berth or anchorage assigned for the same by the Commissioner, pending the examination and inspection herein provided for, or who shall permit or allow any person arriving in such vessel to depart therefrom, and to communicate, mingle, or associate with the population of this State, or any part thereof, until after such examination and inspection by the Commissioner is had, shall, for every such act or omission, forfeit to the Commissioner of Immigration the sum of one thousand dollars in United States gold coin, to be sued for and recovered by suit in any Court of competent jurisdiction, and to be applied in like manner with the fees. And any master, owner, or consignee of any such vessel so arriving, who shall refuse or neglect to pay, or cause to be paid to said Commissioner, the fee of seventy cents for the examination and inspection of each and every person so arriving in such vessel, shall forfeit to said Commissioner, for each case, the sum of five hundred dollars in United States gold coin, to be recovered and applied as above. And the Commissioner shall have a lien upon the vessel, and the same shall be sold to pay any judgment recovered under this Act. The Commissioner shall have the power to call in the aid of the Sheriff and all police authorities to assist in enforcing this law. And he may appoint one or more deputies under him, who shall be vested with all the powers of the Commissioner, and may discharge his official duties when required by him. The Commissioner of Immigration must prepare and transmit to the Secretary of State quarterly statements, certified under his hand and seal, showing the name, age, sex, birthplace, and present residence of every leper, or person affected with leprosy or elephantiasis, examined or inspected by him, as well as any other infor-

mation or fact touching the character and prevalence of said disease within his knowledge. [In effect March 25, 1876.]

SEC. 2959. For all fines and penalties imposed by this chapter upon any master or commander, owner or consignee, for any omission, neglect, or refusal to perform any act or duty required by this chapter, such vessel is liable; and the amount of such fines or penalties are a lien upon such vessel, and have priority over all other liens, except those for seamen's wages, bottomry bonds, and respondentia. Such penalties and fines may be sued for and recovered in a civil action, with costs of suit, by the Commissioner, or by his authorized attorney, in the name of the people of the State of California, in any Court having cognizance thereof, and when recovered must, after deducting the expenses, be paid into the State Treasury.

SEC. 2960. The Commissioner may compound or commute, for any of the penalties or fines, upon such terms as he thinks proper, and at the end of every month report to the Controller of State the reasons and causes of such compounding or commutation. * * *

SEC. 2962. Masters of vessels arriving at any of the ports of this State from any port in this State, or from Oregon or Washington Territory, are exempt from making the statement required by this chapter, when the vessels in which they arrive have not taken on board at their port of departure, or at any intermediate port, any alien passenger, to be landed at the port of arrival; and masters of vessels arriving from Panama are also exempted from the provisions of this chapter, when they have not landed, or are not about to land, passengers who took their departure from ports other than the port of New York; and in no case must such master be required to report any passenger other than way passengers taken on board between the port of New York and the port of arrival in this State.

SEC. 2963. The Consuls, Ministers, agents, or other public functionaries of any foreign Government, arriving in this State in their official capacity, are exempt from the provisions of this chapter.

SEC. 2964. The Commissioner of Immigration must approve all bonds and administer all oaths required in the discharge of his duties. Whenever it appears that the master or commander of any vessel has not made a full and correct report, as provided by this chapter, the Commissioner must inquire into the same, and for that purpose may require the attendance of witnesses before him in the same manner as Notaries Public may in civil cases. Testimony so taken may be read as evidence on the trial of any action commenced for any penalty or forfeiture accruing under the provisions of this chapter in the same manner, and with like effect, as if regularly taken in such action.

SEC. 2966. In all the ports in this State, other than San Francisco, the Mayor or chief municipal officer at such port, or if there be none such, then the Sheriff of that county, is ex officio Commissioner of Immigration for such port, and in carrying out the provisions of this chapter, and has all the powers and is liable to all the penalties provided herein.

SEC. 2968. The Commissioner of Immigration for the port of San Francisco must execute an official bond in the sum of twenty-five hundred dollars. [In effect March 25, 1876.]

CHAPTER II.

PRESERVATION OF PUBLIC HEALTH.

ARTICLE I. STATE BOARD OF HEALTH.

- II. VACCINE AGENT.
- III. HEALTH AND QUARANTINE REGULATIONS FOR THE CITY AND HARBOR OF SAN FRANCISCO.
- IV. HEALTH REGULATIONS FOR THE CITY OF SACRAMENTO.
- V. HEALTH AND QUARANTINE OF OTHER CITIES, TOWNS, AND HARBORS.

ARTICLE I.

STATE BOARD OF HEALTH.

- SECTION 2978. Who constitute the State Board.
- 2979. Duties of.
 - 2980. To report as to the effect of intoxicating liquors.
 - 2981. Meetings, and election of officers.
 - 2982. Duties of Secretary. Salary of Secretary.
 - 2983. Expenses of, limited.

SEC. 2978. The State Board of Health consists of seven physicians—two of the city of Sacramento, and five from other portions of the State—appointed by the Governor for the term of four years.

SEC. 2979. The State Board of Health must place themselves in communication with the local Boards of Health, hospitals, asylums, and public institutions throughout the State, and take cognizance of the interests of health and life among the citizens generally. They must make sanitary investigations and inquiries respecting the causes of disease, especially of epidemics, the source of mortality, and the effects of localities, employments, conditions, and circumstances on the public health, and gather such information in respect to these matters as they may deem proper for diffusion among the people. They may devise some scheme whereby medical and vital statistics of sanitary value can be obtained, and act as an advisory Board to the State in all hygienic and medical matters, especially such as relate to the location, construction, sewerage, and administration of prisons, hospitals, asylums, and other public institutions. They must, at each biennial session of the Legislature, make a report, with such suggestions as to legislative action as they deem proper.

SEC. 2980. The Board must examine into and report what, in their best judgment, is the effect of the use of intoxicating liquor as a beverage upon the industry, prosperity, happiness, health, and lives of the citizens of the State; also, what legislation, if any, is necessary in the premises.

SEC. 2981. The Board must meet at the capital of the State, at least once in every three months. They must elect from their own number a President and a Permanent Secretary; the latter must reside at the capital, and is their executive officer. No member, except the Secretary, receives any compensation; but the actual traveling expenses of the members, while engaged in the duties of the Board, are allowed, and paid out of the General Fund.

SEC. 2982. The Secretary must superintend the work and perform such other duties as the Board may require. He must furnish the Legislature, when in session, such information cognate to this chapter as, from time to time, may be necessary. An annual salary of twenty-five hundred dollars, and his office and other necessary expenses in-

curred in the performance of his duties, must be paid to him in the same manner as salaries of State officers are paid.

SEC. 2983. The expenses of the Board, including the salary of the Secretary, must not exceed four thousand dollars per annum.

ARTICLE II.

VACCINE AGENT.

- SECTION 2993. Agent to obtain genuine vaccine matter.
2994. Compensation and duty of.

SEC. 2993. The Vaccine Agent must obtain a supply of the genuine vaccine matter, and preserve the same for the use and benefit of the citizens of the State. [Basis of article: Stats. 1852, p. 138.]

SEC. 2994. Such agent must furnish genuine vaccine matter, approved by the State Board of Health, to any regular practicing physician in good standing in his profession in this State. He may charge and receive for every parcel of vaccine matter furnished, the sum of five dollars, which is full compensation for his services and expenses.

ARTICLE III.

HEALTH AND QUARANTINE REGULATIONS FOR THE CITY AND HARBOR OF SAN FRANCISCO.

- SECTION 3004. Quarantine grounds, location of.
3005. Board of Health of San Francisco.
3006. Mayor ex officio President. Time of meeting.
3007. Health Officer. His election.
3008. Powers of.
3009. Appointment of certain officers.
3010. Compensation of officers and employés.
3011. Expenses of Health Officer.
3012. General powers of Board of Health.
3013. Shipmasters to report infected vessels.
3014. Passengers and freight; permit to land.
3015. Duties of pilots.
3016. Penalty for neglect of masters.
3017. Vessels subject to quarantine.
3018. Examination and inspection of vessels.
3019. Passengers not to be landed without permit.
3020. Fees of Quarantine Officer.
3021. Compulsory vaccination.
3022. Hospitals to be provided.
3023. Records of births, deaths, and interments.
3024. Returns of births, deaths, etc., of children.
3025. No bodies to be interred without permit.
3026. Returns of interments to be made.
3027. Bodies not to be removed without permit.
3028. Nuisances on premises of non-residents.
3029. Health Officer to keep fee-book.
3030. Bond of Health Officer.
3031. Officers empowered to administer oaths.
3032. Actions, in whose name maintained.
3033. Vacation of infected and dangerous houses.
3034. Physicians to report infectious diseases.
3035. Board of Health to have charge of cemetery.

SEC. 3004. The quarantine grounds of the bay and harbor of San Francisco are at the anchorage of Sausalito.

SEC. 3005. The Board of Health of the City and County of San Francisco consists of the Mayor of the city and county and four physicians in good standing, residing in the City and County of San Francisco, appointed by the Governor, and holding their offices for the term of five years.

SEC. 3006. The Mayor is ex officio President of the Board. The

Board must meet monthly, and at such other times as the President may direct. In the absence of the President, the Board may elect a Chairman, who is clothed with the same powers as the President.

SEC. 3007. The Health Officer for the City and County and Port of San Francisco is elected by the Board of Health, and holds office at its pleasure. He must be a graduate of some medical college, in good standing, and must reside within the city limits of San Francisco.

SEC. 3008. The Health Officer is the executive officer of the Health Department, and he may, in his discretion, cause the removal to a hospital of any and all persons within the limits of the City and County of San Francisco, infected with variola. [In effect March 9, 1878.]

SEC. 3009. The Board of Health must appoint a Quarantine Officer, who shall be a physician in good standing; a Secretary, one Assistant Secretary, six Health Inspectors, one Market Inspector, and one Messenger, whose duties must be fixed by the Board of Health. They must also appoint one Superintendent Physician, one Resident Physician, one Steward, one Matron, one Apothecary, two Visiting Physicians, two Visiting Surgeons, as officers of the City and County Hospital, in and for the City and County of San Francisco; one each of said Visiting Physicians and Surgeons to be nominated by the Faculty of the Medical Department of the University of California, and one each of said Visiting Physicians and Surgeons to be nominated by the Medical College of the Pacific. Said Board may also appoint one Engineer for the City and County Hospital. They may also appoint one Superintendent, one Resident Physician, one Matron, and such other employés as are now authorized by law, to be employed in and for the Almshouse of said city and county. They shall also have power to appoint and prescribe the duties of one City Physician and one Assistant City Physician, who shall be designated as Police Surgeons, and whose duty it shall be to make all autopsies required of them by the Coroner of said city and county. And said Board is also empowered to appoint such employés and such medical attendants as they may deem necessary in the Health Department, and in all the various institutions which are by law placed under their supervision; and the compensation of such employés and medical attendants shall be fixed by the Board of Health. The appointing power aforesaid is vested solely in said Board of Health, and said Board shall have power to prescribe the duties of said appointees, and shall not remove the same without just cause. The heads of departments appointed by the Board of Health, to wit: the Health Officer, Resident Physician of City and County Hospital, and Superintendent of Almshouse, shall not be removed except by a concurrence of four members of said Board of Health.

SEC. 3010. The following annual salaries are hereby allowed to the officers of the Health Department, and such other officers and employés as are mentioned in the preceding section, viz.: Health Officer, three thousand dollars; Quarantine Officer, eighteen hundred dollars; Secretary, two thousand one hundred dollars; Assistant Secretary, one thousand two hundred dollars; Health Inspectors, one thousand two hundred dollars each; Market Inspector, one thousand two hundred dollars; Messenger, nine hundred dollars; City Physician, one thousand eight hundred dollars; Assistant City Physician, one thousand two hundred dollars; all of said salaries, together with the salaries of such other employés of the Health Department as may be appointed by the Board

of Health, must be paid in equal monthly installments out of the General Fund of the City and County of San Francisco, in the same manner as the salaries of the other officers of said city and county are paid. There shall be paid to the officers and employes of the City and County Hospital and Almshouse the following annual salaries, viz.: Superintendent Physician, two thousand four hundred dollars; Resident Physician, one thousand five hundred dollars; Steward, one thousand five hundred dollars; Matron, seven hundred and twenty dollars; one Apothecary, one thousand two hundred dollars; Visiting Physicians and Surgeons, one thousand two hundred dollars each; Engineer, one thousand two hundred dollars; Superintendent of Almshouse, two thousand four hundred dollars; Matron of Almshouse, seven hundred and twenty dollars; and all other medical attendants and employes of said institutions are to be paid such sums as may be authorized by law, and as provided in the preceding section; all to be paid in equal monthly installments, out of the Hospital and Almshouse Fund of said City and County of San Francisco; and the Auditor of said city and county is hereby directed to audit the said demands, payable out of the funds aforesaid, upon the approval of the same by the said Board of Health, and also to audit all demands for salaries of medical attendants and employes appointed by the Board of Health in accordance with this chapter, for the amounts authorized to be paid, when the same shall have been approved by said Board; and the Treasurer of said city and county must pay said demands out of said funds. The Clerk of the Mayor of the City and County of San Francisco shall not receive any compensation as Clerk of the Board of Health. [In effect March 9, 1878.]

SEC. 3011. The Health Officer, in addition to his salary, receives such sums for the necessary expenses of his office as the Board of Health may direct, and the Auditor must audit and the Treasurer pay such sums out of the General Fund. The Board of Supervisors must provide proper offices for the Health Department.

SEC. 3012. The Board of Health have general supervision of all matters appertaining to the sanitary condition of the city and county, including the City and County Hospital, the County Jail, Almshouse, Industrial School, and all public health institutions provided by the City and County of San Francisco; and may adopt such orders and regulations, and appoint or discharge such medical attendants and employes as to them seems best to promote the public welfare; and may appoint as many Health Inspectors as they deem necessary in time of epidemics.

SEC. 3013. Shipmasters bringing vessels into the harbor of San Francisco, and masters, owners, or consignees having vessels in the harbor which have on board any cases of Asiatic cholera, smallpox, yellow, typhus, or ship fever, must report the same, in writing, to the Quarantine Officer before landing any passengers, casting anchor, or coming to any wharf, or as soon thereafter as they, or either of them, become aware of the existence of either of the diseases on board of their vessels. [In effect March 9, 1878.]

SEC. 3014. No Captain or other officer in command of any vessel sailing under a register arriving at the port of San Francisco, nor any owner, consignee, agent, or other person, having charge of such vessel, must, under a penalty of not less than one hundred dollars, nor more

than one thousand dollars, land, or permit to be landed, any freight, passengers, or other persons from such vessel until he has reported to the Quarantine Officer, presented his bill of health, and received a permit from that officer to land freight, passengers, or other persons. [In effect March 9, 1878.]

SEC. 3015. Every pilot who conducts into the port of San Francisco any vessel subject to quarantine, or examination by the Quarantine Officer, must—

First—Bring the vessel no nearer the city than is allowed by law;

Second—Prevent any person from leaving and any communication being made with the vessel under his charge until the Quarantine Officer has boarded her and given the necessary orders and directions;

Third—Be vigilant in preventing any violation of the quarantine laws, and report without delay all such violations that come to his knowledge to the Quarantine Officer;

Fourth—Present the master of the vessel with a printed copy of the quarantine laws, unless he has one;

Fifth—If the vessel is subject to quarantine, by reason of infection, place at the mast-head a small yellow flag. [In effect March 9, 1878.]

SEC. 3016. Every master of a vessel subject to quarantine or visitation by the Quarantine Officer, arriving in the port of San Francisco, who refuses or neglects, either—

First—To proceed with and anchor his vessel at the place assigned for quarantine, when legally directed so to do; or,

Second—To submit his vessel, cargo, and passengers to the Quarantine Officer, and furnish all necessary information, to enable that officer to determine what quarantine or other regulations they ought, respectively, to be subject; or,

Third—To report all cases of disease and of deaths occurring on his vessel, and to comply with all the sanitary regulations of the bay and harbor—

Is liable in the sum of five hundred dollars for every such neglect or refusal. [In effect March 9, 1878.]

SEC. 3017. All vessels arriving off the port of San Francisco from ports which have been legally declared infected ports, and all vessels arriving from ports where there is prevailing, at the time of their departure, any contagious, infectious, or pestilential diseases, or vessels with decaying cargoes, or which have unusually foul or offensive holds, are subject to quarantine, and must be, by the master, owner, pilot, or consignee, reported to the Quarantine Officer without delay. No such vessel must cross a right line drawn from Meiggs Wharf to Alcatraz Island until the Quarantine Officer has boarded her and given the order required by law. [In effect March 9, 1878.]

SEC. 3018. The Quarantine Officer must board every vessel subject to quarantine or visitation by him, immediately on her arrival, make such examination and inspection of vessel, books, papers, or cargo, or of persons on board, under oath, as he may judge expedient, and determine whether the vessel should be ordered to quarantine; and, if so, the period of quarantine. [In effect March 9, 1878.]

SEC. 3019. No Captain or other officer in command of any passenger-carrying vessel of more than one hundred and fifty tons burden, nor of any vessel of more than one hundred and fifty tons burden having passengers on board, nor any owner, consignee, or other person having

charge of such vessel or vessels, must, under a penalty of not less than one hundred dollars, nor more than one thousand dollars, land or permit to be landed any passenger from the vessel, until he has presented his bill of health to the Quarantine Officer, and received a permit from that officer to land such passengers, except in such cases as the Quarantine Officer deems it safe to give the permit before seeing the bill of health. [In effect March 9, 1878.]

SEC. 3020. The following fees may be collected by the Quarantine Officer: For giving a permit to land freight or passengers, or both, from any sailing vessel of less than five hundred tons burden from any port out of this State, two dollars and fifty cents; over five hundred and under one thousand tons burden, five dollars; each additional one thousand tons burden, or fraction thereof, an additional two dollars and fifty cents. For steam vessels propelled in whole or in part by steam, of one thousand tons burden or less, five dollars, and two dollars and fifty cents for each additional one thousand tons burden, or fraction thereof; but vessels not propelled in whole or in part by steam, sailing to and from any port or ports of the Pacific States of the United States or Territories, and whaling vessels entering the harbor of San Francisco, are excepted from the provisions of this section. [In effect March 9, 1878.]

SEC. 3021. The Board of Health may enforce compulsory vaccination on passengers in infected ships, or coming from infected ports.

SEC. 3022. The Board of Health may provide suitable hospitals, to be situated at or near Sausalito, and furnish and supply the same with nurses and attachés, and remove thereto all persons afflicted with cholera, smallpox, yellow, typhus, or ship fever.

SEC. 3023. The Health Officer must keep a record of all births, deaths, and interments occurring in the City and County of San Francisco. Such records, when filled, must be deposited in the office of the County Recorder, and produced when required for public inspection.

SEC. 3024. Physicians and midwives must, on or before the fourth day of each month, make a return to the Health Officer of all births, deaths, and the number of still-born children occurring in their practice during the preceding month. In the absence of such attendants, the parent must make such report within thirty days after the birth of the child. Such returns must be made in accordance with rules adopted, and upon blanks furnished by the Board of Health. [In effect March 9, 1878.]

SEC. 3025. No person shall deposit in any cemetery, or inter in the City and County of San Francisco, any human body without first having obtained and filed with the Health Officer a certificate signed by a physician or midwife, or a Coroner, setting forth, as near as possible, the name, age, color, sex, place of birth, occupation, date, locality, and cause of death of the deceased, and obtain from such Health Officer a permit; nor shall any human body be removed or disinterred without the permit of the Health Officer, or by order of the Coroner. Physicians, when deaths occur in their practice, must give the certificate herein mentioned. Hereafter it shall be the duty of the Assistant City Physician or Police Surgeons to perform all autopsies which may be required in the Coroner's office of the City and County of San Francisco, all such autopsies being made without charge to the city. It shall be the duty of the Health Officer to see that the dead body of a human being is not allowed to remain in any public receiving vault for a longer

period than five days. At the expiration of that time he shall cause the body to be placed in a vault or niche constructed of brick, stone, or iron, and hermetically sealed. It shall also be his duty to require all persons having in charge the digging of graves and burial of the dead, to see that the body of no human being who had reached ten years of age shall be interred in a grave less than six feet deep, or if under the age of ten years, the grave to be not less than five feet deep. [In effect March 9, 1878.]

SEC. 3026. Superintendents of cemeteries within the boundaries of the City and County of San Francisco must return to the Health Officer, on each Monday, the names of all persons interred or deposited within their respective cemeteries for the preceding week. [In effect March 9, 1878.]

SEC. 3027. No Superintendent of a cemetery can remove or cause to be removed, disinter or cause to be disinterred, any corpse that has been deposited in the cemetery, without a permit from the Health Officer, or by order of the Coroner.

SEC. 3028. Whenever a nuisance shall exist on the property of any non-resident, or any property, the owner or owners of which cannot be found by the Health Inspector after diligent search, or on the property of any owner or owners upon whom due notice may have been served, and who shall for three days refuse or neglect to abate the same, or on any city property, it shall be the duty of the Board of Health to cause the said nuisance to be at once removed or abated, and to draw upon the General Fund for such sums as may be required for its removal or abatement, not to exceed two hundred dollars; *provided*, that whenever a larger expenditure is found necessary to be made for the removal or suppression of any nuisance, the Board of Supervisors of said city and county shall, upon the written application of the Board of Health, by ordinance, appropriate, allow, and order paid out of the General Fund, such sum or sums as may be necessary for that purpose; and the Auditor shall audit, and the Treasurer shall pay, all appropriations of money made in pursuance of this section, in the same manner as is now provided by law for auditing and paying demands upon the treasury; said sum or sums so paid shall become a lien on the property from which said nuisance has been removed or abated, in pursuance of this section, and may be recovered by an action against such property. And it shall be the duty of the City and County Attorney to foreclose all such liens in the proper Court, in the name of and for the benefit of said city and county, and when the property is sold, enough of the proceeds shall be paid into the City and County Treasury to satisfy the lien and costs; and the overplus, if any there be, shall be paid to the owner of the property, if he be known, and if not, then into the Court for his use when ascertained. The Board of Health is hereby vested with power to act upon, define, determine, and adjudge what shall constitute a nuisance in said city and county, and to require the same to be abated in a summary manner. Any person who maintains, permits, or allows a nuisance to exist upon his or her property or premises after the same has been determined by said Board to be a nuisance, and after notice to remove the same has been served upon such person, is guilty of a misdemeanor, and shall be punished accordingly; and each day of such existence, after notice, shall be deemed a separate and distinct offense; and it is the duty of the Health Officer to prosecute all persons

guilty of violating this law by continuous prosecutions until the same is abated and removed. [In effect March 9, 1878.]

SEC. 3029. The Health Officer must keep in his office a book in which he must make an entry of all fees collected by him. He must pay all fees collected to the City and County Treasurer weekly, to the credit of the General Fund.

SEC. 3030. The Health Officer must execute an official bond, to be approved by the Board of Health, in the sum of ten thousand dollars.

SEC. 3031. Any member of the Board of Health, Health Officer, or Quarantine Officer, or Secretary, or Assistant Secretary of the Health Department, is empowered to administer oaths on business connected with that department. [In effect March 9, 1878.]

SEC. 3032. Whenever any cause of action arises under any of the provisions of this chapter, suit may be maintained therein in the name of the Health Officer, in any District Court of this State.

SEC. 3033. Whenever it shall be certified to the Board of Health, by the Health Officer, that any building or part thereof is unfit for human habitation, by reason of its being so infected with disease as to be likely to cause sickness among the occupants, or, by reason of its want of repair, has become dangerous to life, said Board may issue an order and cause the same to be affixed conspicuously on the building, or part thereof, and to be personally served upon the owner, agent, or lessee, if the same can be found in this State, requiring all persons therein to vacate such building, for the reasons to be stated therein as aforesaid. Such building, or part thereof, shall, within ten days thereafter, be vacated; or within such shorter time (not less than twenty-four hours), as in said notice may be specified; but said Board, if it shall become satisfied that the danger from said house, or part thereof, has ceased to exist, may revoke said order, and it shall thenceforward become inoperative. [In effect March 9, 1878.]

SEC. 3034. *First*—Every physician in the city and county shall report to the Health Officer, in writing, every patient he shall have laboring under Asiatic cholera, variola, diphtheria, or scarlatina, immediately thereafter, and report to the same officer every case of death from such disease immediately after it shall have occurred.

Second—Every householder in said city and county shall forthwith report in writing, to the Health Officer, the name of every person boarding, or inmate, at his or her house, whom he or she shall have reason to believe sick of cholera or smallpox, and any deaths occurring at his or her house from such disease. [In effect March 9, 1878.]

SEC. 3035. The Board of Health shall have entire charge of the City Cemetery, and shall employ a Superintendent, at a salary of seventy-five dollars per month, the same to be paid as the salaries of other employés are paid. [In effect March 9, 1878.]

ARTICLE IV.

HEALTH REGULATIONS FOR THE CITY OF SACRAMENTO.

- SECTION 3042. Board of Health, who and how appointed.
 3043. Term of office.
 3044. Powers of the Board of Health.
 3045. Pesthouses, how located and conducted.
 3046. Death records.
 3047. Enforcement of regulations. Health Officer.
 3048. Expenses, how paid.
 3049. Compensation, how paid.

SEC. 3042. The Board of Trustees of the city of Sacramento may establish by ordinance a Board of Health therefor, to consist of five practicing physicians, graduates of a medical college of recognized respectability; and the President of the Board of Trustees is ex officio President of the Board.

SEC. 3043. The members of the Board hold their offices at the pleasure of the appointing power.

SEC. 3044. The Board of Health of the city of Sacramento has a general supervision of all the matters appertaining to the sanitary condition of the city, and may make such rules and regulations in relation thereto as are not inconsistent with law.

SEC. 3045. The Board of Health may locate and establish pesthouses, and cause to be removed thereto, and kept, any person having a contagious or infectious disease; may discontinue or remove the same, and make such rules and regulations regarding the conduct of the same as are needful.

SEC. 3046. The Board of Health must exercise a general supervision over the death records of the city of Sacramento, and may adopt such forms and regulations for the use and government of physicians, undertakers, and Superintendents of Cemeteries, as in their judgment may be best calculated to secure reliable statistics of the mortality in the city, and prevent the spread of disease.

SEC. 3047. The Board of Trustees of the city of Sacramento must, by ordinance or otherwise, provide for enforcing such orders and regulations as the Board of Health may from time to time adopt; and in times of epidemics, or when deemed necessary by the Board of Health, a Health Officer must be employed to enforce the laws in relation to the sanitary condition of the city.

SEC. 3048. All expenses necessarily incurred in carrying out the provisions of this article must be provided for by the Board of Trustees of the city of Sacramento, who may make appropriation therefor out of the Special Street Fund, if the same is sufficient; if not, they may by taxation provide a fund therefor.

SEC. 3049. The Board of Trustees must fix the compensation of the Board of Health and the Health Officer.

ARTICLE V.

HEALTH AND QUARANTINE OF OTHER CITIES, TOWNS, AND HARBORS.

- SECTION 3059. Boards of Supervisors may adopt Article III.
 3060. Boards of Supervisors may adopt Article IV.
 3061. Board of Health established in towns and cities.
 3062. May appoint Health Officer in lieu of Board.
 3063. Per capita or property tax, how levied.

SEC. 3059. The Board of Supervisors of any county in which there is a port of entry or harbor, for which there is not otherwise provided health and quarantine regulations, may by an ordinance adopt the whole or any part of the provisions of article three of this chapter, appoint a Board of Health, or Health Officer, locate quarantine grounds when necessary, and provide for the enforcement of health and quarantine regulations.

[Local adaptation of health and quarantine regulations, see Sec. 4046, Sub. 20.]

SEC. 3060. In like manner the Board of Supervisors of any county in which there is an unincorporated city or town, for which there is not otherwise provided a Board of Health, or health regulations in time of epidemics or the existence of contagious or infectious diseases, may by an ordinance adopt for such city or town, in whole or in part, the provisions of article four of this chapter, for some definite period of time, and appoint therefor a Board of Health.

SEC. 3061. It shall be the duty of the Board of Trustees, Council, or other corresponding Board, of every incorporated town and city of this State, to establish, by ordinance, a Board of Health for such town or city to consist of five persons, one of whom at least shall be a practicing physician and a graduate of some reputable school of medicine, and one, if practicable, a civil engineer. The members of the Board shall hold their offices at the pleasure of the appointing power. Every local Board of Health established in this State must:

First—Supervise all matters pertaining to the sanitary condition of their town or city, and make such rules and regulations relative thereto as are necessary and proper, and not contrary to law.

Second—Report to the Secretary of the State Board of Health, at Sacramento, at such times as the State Board of Health may require:

- (a) The sanitary condition of their locality.
- (b) The number of deaths, with the cause of each, as near as can be ascertained, within their jurisdiction, during the preceding month.
- (c) The presence of epidemic or other dangerous, contagious, or infectious disease, and such other matters, within their knowledge or jurisdiction, as the State Board may require.

The Trustees, Council, or other legislative Board, by whatever name known, of any incorporated city or town of this State may, by ordinance, adopt any portion of article three and article four of this chapter, or either of them, for some definite period of time, as may seem proper for the regulation of sanitary matters within their town or city. [In effect March 19, 1878.]

[This Act shall not extend to any incorporated city or town, or city and county, for which health regulations and [are?] provided by special statutes.]

[Local adaptation of health laws, see Sec. 4046, Sub. 20; Sec. 4408, Sub. 18.]

[Section inapplicable to incorporated city, town, etc., for which health regulations provided by special statute, see Sec. 2 of Amendatory Acts in Stats. 1878, p. 59.]

SEC. 3062. The Board of Supervisors of each county must appoint, in each unincorporated city or town of five hundred or more inhabit-

ants, a Health Officer, who has all the duties and powers of the Board of Health and Health Officer, as specified in this and the two preceding articles. [In effect March 1, 1889, as amended.]

SEC. 3063. All necessary expenses of enforcing this article are charges against the counties, cities, or towns, respectively, for the payment of which the county, city, or town may levy a per capita tax of not exceeding three dollars, or a property tax of not exceeding one fourth of one per cent, yearly, until the same is paid.

SEC. 3064. The Board of Supervisors must fix the salary or compensation of Boards of Health or Health Officers, and provide for the expenses of enforcing the provisions of this article. If the Board of Supervisors or Board of Trustees, Council, or other corresponding Board of any incorporated town, neglect to provide a Board of Health or Health Officer by the first day of July, eighteen hundred and eighty-nine, the State Board of Health may direct the District Attorney of the county to begin an action against such Board of Supervisors, or Board of Trustees, or corresponding Board, to compel the performance of their duty, or may appoint a Board of Health, or Health Officer with the powers of a Board of Health, for such town or city, and the expenses of such Board of Health, or Health Officer, shall be a charge against the incorporated city or town for which such appointment shall be made; and when the appointment is made for unincorporated towns the expenses of the Board of Health, or Health Officer, are a charge against the county. [In effect March 1, 1889.]

CHAPTER III.

REGISTRY OF BIRTHS, MARRIAGES, AND DEATHS.

- SECTION 3074. Registry of marriages.
 3075. Registry of births.
 3076. Registry of deaths.
 3077. Reports to Recorder.
 3078. Same.
 3079. Duties of Recorder.
 3080. Report to the Secretary of State Board of Health.
 3081. Fees.
 3082. Penalties.
 3083. Printing and distribution of forms of register.

SEC. 3074. All persons who perform the marriage ceremony must keep a registry of the time of each marriage so celebrated, the residence, the names in full, the place of birth, the age of each party, and whether either party has ever been before married. [In effect March 16, 1878.]

SEC. 3075. All physicians and professional midwives must keep a registry of the time of each birth at which they assist professionally, the sex, race, and color of the child, and the names and residence of the parents.

SEC. 3076. Physicians who attend deceased persons in their last sickness, clergymen who officiate at a funeral, Coroners who hold inquests, sextons and undertakers who bury deceased persons, must each keep a registry of the name, age, residence, and time of death of such person. [Approved March 30th; in effect July 6, 1874.]

SEC. 3077. All persons registering marriages, births, or deaths, must

quarterly file with the County Recorder a certified copy of their register. All such certificates must specify, as near as may be ascertained, the name in full, age, occupation, term of residence in the city or county, birthplace, condition, whether single or married, widow, or widower, sex, race, color, last place of residence, and cause of death of all decedents. [In effect March 16, 1878.]

SEC. 3078. If at birth no physician or midwife attend, then the parents must make the report.

SEC. 3079. The Recorder must keep separate registers, to be known as the "Register of Marriages," the "Register of Births," and the "Register of Deaths," in which the marriages, births, and deaths certified to him must be numbered in the order in which they are reported to him. There must be stated in each register, in separate columns, properly headed, the various facts contained in the certificates, and the name and official or clerical position of the person making the report. The Recorder must carefully examine each report, and register the same marriage, birth, or death but once, although it may be reported by different persons. [In effect March 16, 1878.]

SEC. 3080. The County Recorder must, every three months, transmit to the Secretary of the State Board of Health, at Sacramento City, a certified abstract of the registers of births, marriages, and deaths, prepared in the manner prescribed in the instructions of the Secretary, and upon blanks to be furnished by him for that purpose.

SEC. 3081. County Recorders, in those counties where their compensation is by fees, shall be allowed by the Board of Supervisors a fee of not exceeding ten cents for each name reported, to be paid out of the General Fund of the county; and in those counties where their compensation is by a fixed salary, the duties in this chapter provided shall be performed without compensation other than such salary. [In effect March 16, 1878.]

SEC. 3082. Any person on whom a duty is imposed by this chapter who fails, neglects, or refuses to perform the same as herein required, is liable to a penalty of fifty dollars, to be recovered by the District Attorney of the proper county for the use of the General Fund of such county.

SEC. 3083. The Secretary of the State Board of Health must prepare blank forms of said registers for the State Printer, who must print as many copies as the said Secretary shall direct, and deliver the same to the Secretary of State, who shall forward the same, from time to time, and in such numbers as shall be directed by the Secretary first mentioned, to the County Recorders of the several counties, who must carefully keep and distribute the same to the persons in the county who are required to keep the registers and make the reports provided in this chapter. [In effect March 16, 1878.]

SEC. 3084. No person shall inter, cremate, or otherwise dispose of any human body, in any city, county, or city and county, without having first obtained a permit therefor. In incorporated cities, or counties, or cities and counties, the permit must be obtained from the person authorized to grant the same by any law, ordinance, or resolution passed for that purpose. But in the absence of such law, ordinance, or resolution, the permit must be obtained from either the Coroner, or Health Officer, Board of Health, or if the Coroner be absent, then from the Health Officer or Board of Health; and if there be no Board of Health or Health Officer, then from a Justice of the Peace. The person applying for a per-

mit must produce and file with the officer issuing the permit a certificate signed by a physician, or a Coroner, or two reputable citizens, setting forth as near as possible the name, age, color, place of birth, occupation, date, locality, and cause of death of deceased. And no permit shall be granted without the production of such certificate. Such permit must be filed with the County Recorder, and the person so filing is entitled to the compensation provided for in section three thousand and seventy-seven of this Code, but if any other registration of the death of the deceased shall have been made, the Recorder must record the name but once. [Approved February 25, 1889; in effect thirty days after.]

PART IV—Of the Government of Counties, Cities, and Towns.

TITLE II—The Government of Counties.

CHAPTER II.

THE BOARD OF SUPERVISORS.

ARTICLE II.

GENERAL PERMANENT POWERS.

SEC. 4046. The Boards of Supervisors, in their respective counties, have jurisdiction and power, under such limitations and restrictions, as are prescribed by law:

* * * * *

20. To adapt to the county the provisions in this Code for the preservation of the health of San Francisco or Sacramento, for such limited time as they may deem proper, and to provide for the expense thereof.

ADDITIONAL STATUTES OF CALIFORNIA.

CHAPTER CCXXIX.

An Act to provide for the grading of public alleys and the construction of sewers therein in the city of Sacramento.

[Approved March 21, 1868.]

SECTION 1. Whenever the Board of Trustees of the city of Sacramento shall deem it expedient to construct a sewer in any public alley, they may order such sewer to be constructed, after having published a notice of such intention in some daily newspaper printed in said city, for the period of ten days, unless the owners of more than one half in

extent of the land and lots bisected by such alley shall have made written objections thereto, and delivered the same to the Clerk of said Board of Trustees within the said period of ten days.

SEC. 2. If the owners, or their duly authorized agents, of more than one half in extent of the lands and lots in any block of land bisected by any such alley shall petition said Board of Trustees, in writing, to cause a sewer to be constructed through the same, the said Board of Trustees shall order the same to be done; or whenever the Board of Health of the city of Sacramento shall, by an order duly made and entered on their records, declare that it is necessary for the public health or cleanliness that a sewer should be constructed in any public alley in said city, and shall have delivered a certified copy of said order to the Board of Trustees, the said Board of Trustees shall order such sewer or sewers constructed, and proceed in the same manner as if said work had been petitioned for by the requisite number of property owners, as above. The cost of constructing that portion of all sewers that extend across streets, or that extends from the line of the block to the main sewer, shall be paid by the city out of the Special Street Fund.

CHAPTER CCCXXXIV.

An Act to authorize the establishment of a Board of Health in the city of Sacramento.

[Approved March 27, 1868.]

SECTION 1. The Board of Trustees of the city of Sacramento shall have power to establish, by ordinance, a Board of Health for the city of Sacramento. Said Board of Health shall consist of five practicing physicians, who shall each be graduates of a medical college of recognized respectability, and the President of the Board of Trustees shall be ex officio President of the Board of Health.

SEC. 2. The Board of Health shall have a general supervision of all matters appertaining to the sanitary condition of said city; and full powers are hereby given to said Board to adopt such measures and make such orders and regulations as at any time, in their opinion, the public safety may require, and not in contravention of any law; but such orders and regulations shall not take effect until approved by resolution or order of the Board of Trustees of said city.

SEC. 3. The Trustees of said city shall by ordinance provide, in such manner as to them shall seem best, for enforcing such orders and regulations as the Board of Health shall from time to time adopt.

SEC. 4. The Board of Health now recognized by an ordinance passed by the Trustees of said city, shall continue to perform the duties pertaining to their office until their successors are duly appointed and qualified.

SEC. 5. This Act shall take effect from and after its passage.

CHAPTER CCCXLVI.

An Act amendatory of and supplementary to an Act to authorize the establishment of a Board of Health in the city of Sacramento, approved March 27, 1868.

[In effect March 29, 1870.]

SECTION 1. The Board of Trustees of the city of Sacramento shall have power, and it is hereby made their duty, to establish by ordinance a Board of Health for the city of Sacramento. Said Board of Health shall consist of five practicing physicians, who shall each be graduates of a medical college of recognized respectability, and the President of the Board of Trustees shall be ex officio President of the Board of Health.

SEC. 2. The Board of Health of the city of Sacramento now recognized by the Board of Trustees shall have a general supervision of all matters appertaining to the sanitary condition of said city, and full powers are hereby given to said Board of Health over all questions of foul or defective drainage, and of the disinfecting and cleaning of streets, alleys, cellars, cesspools, or nuisances of any description, and of low places within the city limits calculated to receive and retain unhealthy deposits.

SEC. 3. The Board of Health shall exercise a general supervision over the death records of the city of Sacramento, and adopt such forms and regulations for the use and government of physicians, undertakers, and Superintendents of Cemeteries as in their judgment may be best calculated to secure reliable statistics of the mortality in said city and prevent the spread of disease.

SEC. 4. The Board of Trustees of the city of Sacramento shall, by ordinance or otherwise, provide for enforcing such orders and regulations as the Board of Health may from time to time adopt; and in times of epidemics, or when deemed necessary by the Board of Health, a Health Officer shall be employed to enforce the laws in relation to the sanitary condition of said city.

SEC. 5. All expenses necessarily incurred in carrying out the provisions of this Act shall be provided for by the Board of Trustees of the city of Sacramento, who are hereby authorized and directed to make appropriation therefor out of the special fund called the Street Fund in the Act entitled an Act to amend an Act to incorporate the city of Sacramento, approved April twenty-fifth, eighteen hundred and sixty-three, approved March eighteenth, eighteen hundred and seventy.

CHAPTER CCCCXL.

An Act to confer further powers on the Board of Trustees of the city of Sacramento.

[Approved March 31, 1876.]

SECTION 1. The Board of Trustees of the city of Sacramento are hereby authorized and empowered, and it is made their duty, to require all lots, and portions of lots, in the city of Sacramento, north of R

Street, west of Fourteenth Street, south of that portion of the north levee lying east of Sixth Street, south of that portion of I Street lying west of Sixth Street and east of the Sacramento River, which are covered with stagnant water a portion of the year, to be filled up to such level or grade as will prevent the same from being so covered.

SEC. 2. Whenever said Board shall declare a lot or portion of lot to be included within the provisions of section one herein, they shall cause to be entered in their minutes of proceedings an order, which may be in substance in the following form: The Board of Trustees of the city of Sacramento hereby determine that (here describe the real estate) is covered with stagnant water portions of the year. It is therefore ordered that the owner or owners thereof fill up the same to a proper level, to be fixed by the City Surveyor, or that the same be filled up at his or their expense. The owner of any lot, or portion thereof, included in such order, may at any time prior to awarding a contract for doing the work, as provided in section three herein, present and file with the Board a protest against the filling up of such lot as contemplated by the order, on the ground that such lot, or portion thereof, is not, during any portion of the year, covered with stagnant water. And if, on a hearing of such protest, the Board finds the same to be true, they shall, by their order, exclude such lot, or portion of a lot, from their original order; but if the Board finds the protest to be not true, they shall proceed as if no protest had been presented and filed. [Amendment of March 30, 1878.]

* * * * *
[Other sections relate to fixing grade, awarding contracts, assessment and payment of costs.]

CHAPTER CCXXXII.

[Stats. of 1875-6, p. 306.]

SECTION 4. No person, master, captain, or conductor in charge of any boat, vessel, railroad car, or public or private conveyance, shall receive for transportation, or shall transport, the body of any person who has died within the limits of the City and County of San Francisco, without obtaining a permit for the same from the Health Officer, which permit must accompany the body to its destination; and no person, master, captain, or conductor, as aforesaid, shall bring into or transport through the said city and county the dead body of any person, unless it be accompanied with a certificate from some proper authority of the place whence it came, stating name, age, sex, and cause of death, which certificate shall be filed at the Health Office; *provided*, that in no case shall the body of any person who died of a contagious disease be brought to the city within one year of the day of death.

CHAPTER DCLXXIII.

An Act to protect public health from infection caused by exhumation and removal of the remains of deceased persons.

[In force May 1, 1878.]

SECTION 1. It shall be unlawful to disinter or exhume from a grave, vault, or other burial place, the body or remains of any deceased person, unless the person or persons so doing shall first obtain, from the Board of Health, Health Officer, Mayor, or other head of the municipal government of the city, town, or city and county, where the same are deposited, a permit for said purpose. Nor shall such body or remains disinterred, exhumed, or taken from any grave, vault, or other place of burial or deposit, be removed or transported in or through the streets or highways of any city, town, or city and county, unless the person or persons removing or transporting such body or remains shall first obtain from the Board of Health, or Health Officer (if such Board or officer there be), and from the Mayor or other head of the municipal government of the city or town, or city and county, a permit, in writing, so to remove or transport such body or remains in and through such streets and highways.

SEC. 2. Permits to disinter or exhume the bodies or remains of deceased persons, as in the last section, may be granted, provided the person applying therefor shall produce a certificate from the Coroner, the physician who attended such deceased person, or other physician in good standing cognizant of the facts, which certificate shall state the cause of death, or disease of which the person died, and also the age and sex of such deceased; *and provided further*, that the body or remains of deceased shall be inclosed in a metallic case or coffin, sealed in such manner as to prevent, as far as practicable, any noxious or offensive odor or effluvia escaping therefrom, and that such case or coffin contains the body or remains of but one person, except where infant children, of the same parent or parents, or parent and children, are contained in such case or coffin. And the permit shall contain the above conditions, and the words: "Permit to remove and transport the body of —, age—, sex—," and the name, age, and sex shall be written therein. The officer of the municipal government of the city or town, or city and county, granting such permit, shall require to be paid for each permit the sum of ten dollars, to be kept as a separate fund by the Treasurer, and which shall be used in defraying expenses of and in respect to such permits, and for the inspection of the metallic cases, coffins, and inclosing boxes herein required; and an account of such moneys shall be embraced in the accounts and statements of the Treasurer having the custody thereof.

SEC. 3. Any person or persons who shall disinter, exhume, or remove, or cause to be disinterred, exhumed, or removed, from a grave, vault, or other receptacle or burial place, the body or remains of a deceased person without a permit therefor, shall be guilty of a misdemeanor, and be punished by a fine not less than fifty nor more than five hundred dollars, or by imprisonment in the County Jail for not less than thirty days nor more than six months, or by both such fine and imprisonment. Nor shall it be lawful to receive such body, bones, or remains on any

vehicle, car, barge, boat, ship, steamship, steamboat, or vessel for transportation in or from this State, unless the permit to transport the same is first received, and is retained in evidence by the owner, driver, agent, superintendent, or master of the vehicle, car, or vessel.

SEC. 4. Any person or persons who shall move or transport, or cause to be moved or transported, on or through the streets or highways of any city or town, or city and county, of this State, the body or remains of a deceased person, which shall have been disinterred or exhumed without a permit, as described in section two of this Act, shall be guilty of a misdemeanor, and be punishable as provided in section three of this Act.

SEC. 5. Any person who shall give information to secure the conviction of any person or persons for the violation of the provisions of this Act, shall be entitled to receive the sum of twenty-five dollars, to be paid from the fund collected from fines imposed and accruing under this Act.

SEC. 6. Nothing in this Act contained shall be taken to apply to the removal of the remains of deceased persons from one place of interment to another cemetery or place of interment within this State; *provided*, that no permit shall be issued for the disinterment or removal of any body unless such body has been buried for one year or more, without the written consent of the Mayor, Chairman of the Board of Supervisors, or City Council of any municipality of the State. [As amended and passed, March, 1889.]

CHAPTER CCXLVII.

An Act authorizing the Mayor and Common Council of the City of San José to establish and provide for the maintenance of a Board of Health.

[Approved March 16, 1878.]

SECTION 1. The Mayor and Common Council of the city of San José may establish, by ordinance, a Board of Health therefor, to consist of five regular practicing physicians, graduates of a medical college of recognized respectability.

SEC. 2. The members of the Board hold their offices at the pleasure of the appointing power.

SEC. 3. The Board of Health of the city of San José has a general supervision of all the matters appertaining to the sanitary condition of the city, and make such rules and regulations in relation thereto as are not inconsistent with law.

SEC. 4. The Mayor is ex officio President of the Board. The Board must meet monthly, and at such other times as the President may direct. In the absence of the President, the Board may elect a Chairman, who is clothed with the same power as the President.

SEC. 5. The Health Officer of the city of San José is elected by the Board of Health, and holds office at its pleasure. He must be a graduate of some medical college in good standing, and must reside within the city of San José.

SEC. 6. The Health Officer may perform all acts which Quarantine Officers are usually authorized to perform, and he is the executive officer of the Board of Health.

SEC. 7. The Board of Health may locate and establish pesthouses, and cause to be removed thereto, and kept, any person having a contagious or infectious disease; may discontinue or remove the same, and make such rules and regulations regarding the conduct of the same as are needful.

SEC. 8. The Board of Health may exercise a general supervision over the death records of the city of San José, and may adopt such forms and regulations for the use and governance of physicians, and undertakers, and Superintendent of Cemeteries, as in their judgment may be best calculated to secure reliable statistics of the mortality in the city, and prevent the spread of disease.

SEC. 9. The Mayor and Common Council of the city of San José must, by ordinance or otherwise, provide for enforcing such orders and regulations as the Board of Health may from time to time adopt.

SEC. 10. All expenses necessarily incurred in carrying out the provisions of this article must be provided for by the Mayor and Common Council of the city of San José, who may make appropriation therefor out of the Special Street Fund, if the same is sufficient; if not, they may, by taxation, provide a fund therefor.

SEC. 11. The Mayor and Common Council must fix the compensation of the Board of Health and Health Officer.

CHAPTER CCCXXV.

An Act to provide and maintain a system of sewerage in the city of Petaluma, and to take private lands therefor.

[In effect March 23, 1878.]

SECTION 1. The Board of Trustees of the city of Petaluma are hereby empowered and directed to have surveyed, laid out, established, constructed, and maintained, a general system of sewerage for the city of Petaluma, and for that purpose shall employ a competent engineer to survey, map, and plat such contemplated sewerage, showing the location, length, and size of such sewers, which survey, map, and plat, when completed, with his recommendations, he shall file with the Clerk of the Board of Trustees; upon the filing of which, the Board of Trustees shall give at least ten days' notice, by publication in some newspaper published in said city, of the time and place when they will consider said report and hear objections, and may modify and correct the same; and so modified and corrected shall, by resolution, adopt the same, or any part thereof, as the official map of sewers. The compensation of such engineer, and such assistants as may be required, shall be determined by said Board, and shall be paid by warrant on the Sewer Fund of said city.

SEC. 2. In order to provide for the necessary and proper drainage and sewerage of the city of Petaluma, the Board of Trustees thereof are hereby authorized to procure the right of way by purchase, or condemnation, for such main and lateral sewers or drains as they may deem proper for the sewerage and drainage of said city; such rights of way may be thus secured through lands within the corporate limits, and

also when required through lands adjacent to and without said city, under the provisions of part three, title seventeen, of the Code of Civil Procedure, for the purpose of condemning such lands, or the right of way through the same, to the use of the city for public drains or sewers; *provided*, that the benefits resulting to the land remaining or adjoining may be offset against the value of the land actually taken, as also against any damages resulting to such adjacent land from such improvement.

SEC. 3. The Board of Trustees of the city of Petaluma, in addition to the taxes now authorized by law, are hereby authorized and empowered to levy annually an additional tax on all real and personal property of said city, not to exceed twenty cents on each one hundred dollars, to be levied and collected at the same time and in the same manner as other city taxes, and to be known as the sewer tax, which shall constitute a separate fund, to be known as the "Sewer Fund."

SEC. 4. It shall be the duty of the Board of Trustees to construct, maintain, and keep in repair, according to the general system of sewerage adopted, such sewers as from time to time they may deem necessary for the health and welfare of said city.

SEC. 5. All proceedings, contracts, and work in relation to the construction of sewers under this Act, shall be governed in all respects by the provisions of the city charter in relation to street work, except that no petition of property owners shall be necessary. The Board must not, without the consent of owners of adjacent property, change the width of any sidewalk, after said sidewalk has been constructed, for a period of five years.

CHAPTER CCCIV.

An Act to promote the sanitary condition of towns and villages in Fresno County.

[Approved March 20, 1873.]

SECTION 1. It is unlawful for any person, being a resident within any town or village, incorporated or unincorporated, which contains ten or more dwellings, to have or allow on his, her, or their premises, or permit to accumulate upon the half of any street or alley contiguous thereto, any filth or rubbish, or have any deposit of excrement or other filth upon either, or to permit such premises to become in any manner filthy or in an unhealthy condition.

SEC. 2. Upon the application of any resident of any such town or village, if unincorporated, the Board of Supervisors of the county wherein the same is situate, shall define and place of record in their minutes the limits and boundaries thereof; said Board shall appoint one of the Constables of the township wherein such town or village is situate, and notify him of his appointment, to carry out the provisions of this Act as hereinafter specified.

SEC. 3. It is the duty of such Constable, when so appointed, to inspect the premises of every street, alley, or vacant lot within the limits of the town or village for which he is appointed at least twice during each month, upon the first and third Mondays thereof, and in case that he find that any premises, or the half of any streets or alleys contigu-

ous thereto, have upon them any filth or rubbish, or any deposit of excrement or other filth, he shall give written notice to the owner or occupant of such premises to remove the same; and in case the same be not removed within three days thereafter, he shall cause it to be done and such premises thoroughly cleansed in the manner directed by the Health Officer of the county, if there be one, at the expense of the owner or occupant, including his fee of two dollars for each premises so cleansed by him; and it is the duty of such Health Officer to give written directions to such Constable as to how he shall cleanse premises, and such Health Officer shall, at the request of any citizen, examine any premises and require such Constable to cleanse the same and see that such cleansing is properly and efficiently done.

SEC. 4. If said expenses and fee be not paid on presentation of his itemized account therefor, the Constable may maintain action therefor, including a reasonable attorney's fee, to be fixed by the Court; and from the execution in such action no property of the defendant shall be exempt.

SEC. 5. If the Constable cannot find the owner or occupant of any premises within the limits of the town for personal service of the notice hereinbefore mentioned, such notice may be served by posting the same upon some conspicuous place on such premises.

SEC. 6. For every failure or refusal of the Constable or Health Officer to perform any of their duties under this Act, they shall, respectively, forfeit fifty dollars, to be recovered by action, one half to be paid to any person bringing such action, and the other half into the County Indigent Sick Fund. The sureties of the Constable shall be liable for such penalty; but the Health Officer shall not, in the performance of his duties, be required to go beyond the limits of the town wherein he resides.

SEC. 7. This Act shall take effect immediately, and shall apply only to the county of Fresno.

CHAPTER CCCLXXIV.

An Act to establish a Board of Health for the county of Tulare.

[In effect March 26, 1878.]

SECTION 1. There shall be a Board of Health in and for the county of Tulare, consisting of three practical physicians, who are graduates of some medical college in good standing, two of whom, at least, shall be residents of the city of Visalia; and said Board shall serve without compensation.

SEC. 2. The Board of Supervisors of the county of Tulare, at their next regular meeting in May, eighteen hundred and seventy-eight, shall appoint a Board of Health for said county, one of whom shall hold office for the term of one year thereafter, and one for two years, and the other for three years, to be designated by said Board of Supervisors; and annually thereafter, at their regular meeting in May, said Board of Supervisors shall appoint a member of said Board of Health, who shall hold office for the term of three years; and all vacancies shall be filled by said Board of Supervisors by appointment.

SEC. 3. The Board of Health shall have general supervision of all matters appertaining to the sanitary condition of said county, and full powers are hereby given to said Board to adopt such measures and make such orders and regulations as at any time, in their opinion, the public safety may require, and not in contravention of any law. They shall have power to declare any place where they shall have reason to believe a pestilential, contagious, or infectious disease is probably prevailing to an alarming extent to be an infected place, and to fix the period for so considering such place, notice of which shall be given by posting notices or by publication, as said Board shall deem proper.

SEC. 4. All the necessary expenses incurred by said Board of Health for printing, stationery, etc., shall be allowed by the Board of Supervisors and ordered paid out of the General Fund of said county.

SEC. 5. The Board of Health may appoint a clerk, who shall receive a reasonable compensation for his services, not exceeding two hundred dollars per annum, to be fixed and allowed by the Board of Supervisors and payable out of the General Fund of said county.

SENATE CONCURRENT RESOLUTION No. 25.

Relative to appointment of the members of the State Board of Health to consider the subject of a hospital for consumptives.

[Adopted April, 1880.]

Resolved, the Assembly concurring, That a committee of three members of the State Board of Health, to be designated by the Governor, be and are hereby appointed to consider the subject of a State Hospital for Consumptives, to determine a suitable locality, to investigate the probable cost, to devise a general scheme for the construction and management of such an institution, and to report the results of their investigations to the Legislature at its next session.

ASSEMBLY JOINT RESOLUTION No. 7.

Relative to the procuring of a quarantine depot.

[Adopted April 10, 1880.]

WHEREAS, The city of San Francisco, by reason of its commercial relations with Asiatic ports, is alarmingly exposed to the introduction of contagious diseases; and whereas, the port of San Francisco has no place where passengers and cargo can be landed and the necessary sanitary precautions adopted; therefore, be it

Resolved by the Assembly, the Senate concurring, That our Senators and Representatives are hereby requested to use their utmost endeavors to receive from the General Government a portion of one of the islands in the bay of San Francisco for use as a quarantine depot.

Resolved, That the Governor be requested to transmit a copy of these resolutions to each of our Senators and Representatives in Congress.

ASSEMBLY CONCURRENT RESOLUTION No. 23.

Relative to the establishment of a quarantine station on Angel Island.

[Adopted 1880.]

WHEREAS, It is necessary that some convenient place should be provided for quarantine grounds in the harbor of San Francisco, and near the city; and whereas, the State Board of Health, after the most careful examination, are unable to find any suitable place in said harbor, except the northern end of Angel Island, and near the eastern side thereof; therefore,

Resolved by the Assembly, the Senate concurring, That our Senators be instructed, and our Representatives in Congress be requested, to procure a strip of land jutting out into the bay at the northeastern part of Angel Island, in the harbor of San Francisco, consisting of not more than two acres, from the Government of the United States, as a quarantine station for San Francisco, and, if necessary, to procure the necessary legislation for that purpose.

Resolved, That a copy of these resolutions be forwarded by the Governor to each of our Senators and Representatives in Congress.

CHAPTER XC.

An Act to prevent the introduction of contagious or infectious diseases into the State of California.

[In effect March 15, 1883.]

SECTION 1. Whenever there shall exist, in the opinion of the State Board of Health, imminent danger of the introduction of contagious or infectious diseases into the State of California, by means of railroad communication with other States, the State Board of Health are authorized, and it is hereby made their duty, to make or cause to be made, by an accredited agent or inspector, an inspection of all railroad cars coming into the State at such point, or between such points within the State limits as may be selected for the purpose.

SEC. 2. Such inspection shall be made, where practicable, during the ordinary detention of a train at a station, or while in transit between stations, and in all cases shall be so conducted as to occasion the least possible detention or interruption of travel or inconvenience to the railroad companies, so far as consistent with the purposes of this Act.

SEC. 3. Should the discovery be made of the existence among the passengers of any case or cases of dangerous, contagious, or infectious disease, the said Board of Health, or their agent or inspector, under rules and conditions prescribed by them as being applicable to the nature of the disease, shall have power to cause the side-tracking or detention of any car or cars so infected, to isolate the sick, or remove them to a suitable place for treatment, to establish a suitable refuge station, to cause the passengers and materials in such infected car to be subjected to disinfection and cleansing before proceeding farther into the State,

and, in the case of smallpox, to offer free vaccination to all persons exposed in any car or at any station.

SEC. 4. The sum of five hundred dollars is hereby appropriated out of any moneys in the treasury not otherwise appropriated, to be expended solely for the purposes of this Act, and all expenditures herein authorized shall be specified in an itemized account to be presented to the State Board of Examiners, and paid as other demands on the treasury are paid; *provided*, that in no case shall the sum expended exceed that herein specially appropriated for the purpose.

CHAPTER XIV.

An Act to grant to Boards of Health, or Health Officers, in cities and cities and counties, the power to regulate the plumbing and drainage of buildings, and to provide for the registration of plumbers.

[In force March 3, 1885.]

SECTION 1. It shall not be lawful for any person to carry on business, or labor as a master or journeyman plumber, in any incorporated city, or in any city and county, in this State, until he shall have obtained from the Board of Health of said city, or city and county, a license authorizing him to carry on business, or labor as such mechanic. A license so to do shall be issued only after a satisfactory examination by the Board of each applicant upon his qualifications to conduct such business, or to so labor. All applications for license, and all licenses issued, shall state the name in full, age, nativity, and place of residence of the applicant or person so licensed. It shall be the duty of the Secretary of each Board of Health to keep a record of all such licenses issued, together with an alphabetical index of the same. [As amended March 9, 1887.]

SEC. 2. A list of all licensed plumbers shall be published in the yearly report of the Health Officer or Board of Health. [As amended March 9, 1887.]

SEC. 3. The drainage and plumbing of all buildings, both public and private, hereafter erected in any city, or city and county, shall be executed in accordance with plans previously approved in writing by the Board of Health of said city, or city and county, and suitable drawings and description of said drainage and plumbing shall, in each case, be submitted to the Board of Health, and placed on file in the Health Office. The said Board of Health is also authorized to receive and place on file drawings and descriptions of the drainage and plumbing of buildings erected prior to the passage of this Act.

SEC. 4. The Board of Supervisors, or other city, or city and county officials, whose duty it is to make appropriation and tax levies for general purposes of such city, or city and county, shall make the necessary appropriations and tax levies, and shall insert the same in the yearly tax levy, to provide for carrying out the provisions of this Act. Such appropriations and tax levy shall be made at the same time and in the same manner as appropriations and tax levies are made for other city, or city and county purposes.

SEC. 5. In any city, or city and county, where there is under existing laws a Health Officer but no Board of Health, such Health Officer shall perform all the duties required by this Act of the Board of Health, until a Board of Health shall be created; and in any city, or city and county, where there is no Health Officer nor Board of Health, the Board of Supervisors, or City Council, or other municipal legislative Board or body, shall create a Board of Health, who shall perform all the duties required by this Act of the Board of Health or Health Officer.

SEC. 6. Any Superior Court, or Judge thereof, shall have power to restrain, by injunction, the continuance of work to be done upon or about buildings or premises where the provisions of this Act have not been complied with, and no undertaking shall be required as a condition to the granting or issuing of such injunction, or by reason thereof.

SEC. 7. Any person violating any of the provisions of this Act shall be deemed guilty of a misdemeanor, and upon conviction shall be punished accordingly.

CHAPTER XXXVIII.

An Act to provide for analyzing the minerals, mineral waters, and other liquids, and the medicinal plants of the State of California, and of foods and drugs, to prevent the adulteration of the same.

[Approved March 9, 1885.]

SECTION 1. The Governor of the State of California shall appoint one of the professors of the State University of California of sufficient competence, knowledge, skill, and experience, as State Analyst, whose duty it shall be to analyze all articles of food, drugs, medicines, medicinal plants, minerals and mineral waters, and other liquids or solids which shall be manufactured, sold, or used within this State, when submitted to him, as hereinafter provided.

SEC. 2. The State Board of Health and Vital Statistics, or medical officers of health of any city, town, or of any city and county, or county, may, at the cost of their respective Boards or corporations, purchase a sample of any food, drugs, medicines, medicinal plants, mineral waters, or other liquids offered for sale in any town, village, or city in this State, and submit the same to the State Analyst, as hereinafter provided; and said Analyst shall, upon receiving such article duly submitted to him, forthwith analyze the same, and give a certified certificate to the Secretary of the State Board of Health submitting the same, wherein he shall fully specify the result of the analysis; and the certificate of the State Analyst shall be held in all the Courts of this State as prima facie evidence of the properties of the articles analyzed by him.

SEC. 3. Any person desiring an analysis of any food, drug, medicine, medicinal plant, soil, mineral water, or other liquid, shall submit the same to the Secretary of the State Board of Health, together with a written statement of the circumstances under which he procured the article to be analyzed, which statement must, if required by him, be verified by oath; and it shall be the duty of the Secretary of the State

Board of Health to transmit the same to the State Analyst, the expenses thereof to be defrayed by the said Board.

SEC. 4. The State Analyst shall report to the State Board of Health the number of all the articles analyzed, and shall specify the results thereof to said Board annually, with a full statement of all the articles analyzed, and by whom submitted.

SEC. 5. The State Board of Health may submit to the State Analyst any samples of food, drugs, medicines, medicinal plants, mineral waters, or other liquids, for analysis, as hereinbefore provided.

SEC. 6. It shall be competent for the Mineralogist of the State of California to submit to the State Analyst any minerals of which he desires an analysis to be made; *provided*, that the cost of the same shall be defrayed by the Mineralogical Bureau.

SEC. 7. The Board of State Viticultural Commissioners shall have the same privileges as are provided for the State Board of Health under this Act, with respect to samples of wines and grape spirits, and of all liquids and compounds in imitation thereof; and any person or persons desiring analyses of such products shall submit the same to the Secretary of the said Board of State Viticultural Commissioners, and the same shall be transmitted to the State Analyst, in the manner prescribed in section three of this Act. The analyses shall be made, and the certificates of the State Analyst shall be forwarded to the Secretary of the said Board of State Viticultural Commissioners, and shall have the same force and effect as provided for in section two of this Act, with respect to analyses made for the State Board of Health.

CHAPTER XXII.

An Act to appropriate money to prevent the introduction of contagious and infectious diseases.

[In force March 4 1887.]

SECTION 1. The sum of ten thousand dollars is hereby appropriated out of the General Fund in the State Treasury, to be expended by the State Board of Health, under the direction of the Governor, for the prevention of the introduction of any contagious and infectious diseases into the State. The claims for such expenditures must be audited by the Board of Examiners; except that when a contingency arises, which, in the opinion of the Governor, demands the immediate use of money, the Controller may draw his warrant, upon the order of the Governor, in such sums, not exceeding one thousand dollars, as he may direct, in the name of the State Board of Health; *provided*, that an account must be thereafter filed with the Board of Examiners, and audited by it, and transmitted to the Controller, showing the manner of such expenditure.

CHAPTER XXIV.

An Act to encourage and provide for a general vaccination in the State of California.

[In force February 20, 1889.]

SECTION 1. The Trustees of the several common school districts in this State, and Boards of common school government in the several cities and towns, are directed to exclude from the benefits of the common schools therein any child or any person who has not been vaccinated, until such time when said child or person shall be successfully vaccinated; *provided*, that any practicing and licensed physician may certify that the child or person has used due diligence and cannot be vaccinated so as to produce a successful vaccination, whereupon such child or person shall be excepted from the operation of this Act.

SEC. 2. The Trustees or local Boards, annually, or at such special times to be stated by the State Board of Health, must give at least ten days' notice, by posting a notice in two or more public or conspicuous places within their jurisdiction, that provision has been made for the vaccination of any child of suitable age who may desire to attend the common schools, and whose parents or guardians are pecuniarily or otherwise unable to procure vaccination for such child.

SEC. 3. The said Trustees or Board must, within sixty days after the passage of this Act, and every year thereafter, ascertain the number of children or persons in their respective school districts, or subdivision of the city school government, being of an age suitable to attend common schools, who have not been already vaccinated, and make a list of the names of all such children or persons. It also shall be the duty of said Trustees or Board to provide, for the vaccination of all such children or persons in their respective school districts, a good and reliable vaccine virus wherewith to vaccinate such children or persons who have not been vaccinated. And when so vaccinated to give a certificate of vaccination, which certificate shall be evidence thereof for the purpose of complying with section one.

SEC. 4. The necessary expenses incurred by the provisions of this Act shall be paid out of the common school moneys apportioned to the district, city, or town. And if there be not sufficient money, the Trustees must notify the Board of Supervisors of the amount of money necessary, and the Board must, at the time of levying the county tax, levy a tax upon the taxable property in the district sufficient to raise the amount needed. The rate of taxation is ascertained by deducting fifteen per cent for delinquencies from the assessment, and the rate must be based upon the remainder. The tax so levied must be computed and entered upon the assessment roll by the County Auditor, and collected at the same time and in the same manner as State and county taxes, and when collected shall be paid into the county treasury for the use of the district.

SEC. 5. The Trustees of the several school districts of this State are hereby required to include in their annual report, and report to the Secretary of the State Board of Health, the number in their several districts between the ages of five and seventeen years who are vaccinated and the number unvaccinated.

CHAPTER V.

An Act to provide for the proper sanitary condition of factories and workshops, and the preservation of the health of the employés.

[In force February 6, 1889.]

SECTION 1. Every factory, workshop, mercantile or other establishment, in which five or more persons are employed, shall be kept in a cleanly state and free from the effluvia arising from any drain, privy, or other nuisance, and shall be provided, within reasonable access, with a sufficient number of water-closets or privies for the use of the persons employed therein. Whenever the persons employed as aforesaid are of different sexes, a sufficient number of separate and distinct water-closets or privies shall be provided for the use of each sex, which shall be plainly so designated, and no person shall be allowed to use any water-closet or privy assigned to persons of the other sex.

SEC. 2. Every factory or workshop in which five or more persons are employed shall be so ventilated while work is carried on therein that the air shall not become so exhausted as to be injurious to the health of the persons employed therein, and shall also be so ventilated as to render harmless, as far as practicable, all the gases, vapors, dust, or other impurities generated in the course of the manufacturing process or handicraft carried on therein, that may be injurious to health.

SEC. 3. No basement, cellar, underground apartment, or other place which the Commissioner of the Bureau of Labor Statistics shall condemn as unhealthy and unsuitable, shall be used as a workshop, factory, or place of business in which any person or persons shall be employed.

SEC. 4. If in any factory or workshop any process or work is carried on by which dust, filaments, or injurious gases are generated or produced that are liable to be inhaled by the persons employed therein, and it appears to the Commissioner of the Bureau of Labor Statistics that such inhalation could, to a great extent, be prevented by the use of some mechanical contrivance, he shall direct that such contrivance shall be provided, and within a reasonable time it shall be so provided and used.

SEC. 5. Every person, firm, or corporation employing females in any manufacturing, mechanical, or mercantile establishment shall provide suitable seats for the use of the females so employed, and shall permit the use of such seats by them when they are not necessarily engaged in the active duties for which they are employed.

SEC. 6. Any person or corporation violating any of the provisions of this Act shall be punished by a fine of not less than fifty nor more than one hundred dollars for each offense.

SEC. 7. It shall be the duty of the Commissioner of the Bureau of Labor Statistics to enforce the provisions of this Act.

CHAPTER CXLVIII.

An Act to create the office of Attorney for the State Board of Health and the Board of Health of the City and County of San Francisco.

[Approved March 31, 1891.]

SECTION 1. The office of Attorney for the State Board of Health and the Board of Health of the City and County of San Francisco is hereby created; such attorney shall be appointed by the Governor, and shall hold his office as such attorney for the term of four years, and until his successor is elected and qualified.

SEC. 2. It shall be the duty of such attorney to act for and represent the State Board of Health and the Board of Health of the City and County of San Francisco in all legal matters which may require their attention as such Boards of Health, and to specially represent and act for and in coöperation with said Boards of Health, when required by them, in the prevention of all acts and things which, in the judgment of said Boards of Health, or either of them, may have a tendency to be detrimental to the health of the people of the State; and in such other matters pertaining to the health of the State in general and the duties of said Boards of Health, to assist and aid them with his advice, and to represent and act for them in Court.

SEC. 3. The salary of such attorney shall be three thousand dollars per annum, and shall be paid out of the State Treasury, upon warrants drawn by the Controller, in the same manner as the salaries of other State officers are paid.

SEC. 4. All Acts and parts of Acts in conflict with this Act are hereby repealed.

SEC. 5. This Act shall take effect and be in force from and after its passage.

PENAL CODE.

PART I, TITLE IX, CHAPTER VII.

RELATIVE TO THE SMOKING OF OPIUM.

SEC. 307. Every person who opens and maintains, to be resorted to by other persons, any place where opium, or any of its preparations, is sold or given away, to be smoked at such place, and any person who at such place sells or gives away any opium, or its said preparation, to be there smoked or otherwise used, and every person who visits or resorts to any such place for the purpose of smoking opium, or its said preparations, is guilty of a misdemeanor, and upon conviction thereof shall be punished by a fine not exceeding five hundred dollars, or imprisonment in the county jail not exceeding six months, or by both such fine and imprisonment. [In effect March 4, 1881.]

PART I, TITLE X.

OF CRIMES AGAINST THE PUBLIC HEALTH.

- SECTION 370. Public nuisance defined.
 371. Unequal damage.
 372. Maintaining a nuisance a misdemeanor.
 373. Establishing or keeping pesthouses within cities, towns, etc.
 374. Putting dead animals in streets, rivers, etc.
 376. Violation of quarantine laws by masters of vessels.
 377. Willful violation of health laws.
 378. Neglecting to perform duties under health law.
 380. Apothecary omitting to label drugs, or labeling them wrongfully, etc.
 382. Adulterating food, drugs, liquors, etc.
 383. Disposing of tainted food, etc.
 394. Exposing person infected with any contagious disease in a public place.
 400. Using or exposing animal with glanders.
 401. Animal having glanders to be killed.
 402. Adulterating candy.

SEC. 370. Anything which is injurious to health, or is indecent, or offensive to the senses, or an obstruction to the free use of property, so as to interfere with the comfortable enjoyment of life or property, by an entire community or neighborhood, or by any considerable number of persons, or unlawfully obstructs the free passage or use, in the customary manner, of any navigable lake, or river, bay, stream, canal, or basin, or any public park, square, street, or highway, is a public nuisance. [In effect July 1, 1874.]

SEC. 371. An act which affects an entire community or neighborhood, or any considerable number of persons, as specified in the last section, is not less a nuisance because the extent of the annoyance or damage inflicted upon individuals is unequal. [In effect July 1, 1874.]

SEC. 372. Every person who maintains or commits any public nuisance, the punishment for which is not otherwise prescribed, or who willfully omits to perform any legal duty relating to the removal of a public nuisance, is guilty of a misdemeanor.

SEC. 373. Every person who establishes or keeps, or causes to be established or kept, within the limits of any city, town, or village, any pesthouse, hospital, or place for persons affected with contagious or infectious diseases, is guilty of a misdemeanor.

SEC. 374. Every person who puts the carcass of any dead animal, or the offal from any slaughter-pen, corral, or butcher shop, into any river, creek, pond, reservoir, stream, alley, public highway, or road in common use, or who attempts to destroy the same by fire within one fourth of a mile of any city, town, or village, and every person who puts the carcass of any dead animal, or any offal of any kind, in or upon the borders of any stream, pond, lake, or reservoir, from which water is drawn for the supply of the inhabitants of any city, city and county, or any town, in this State, so that the drainage from such carcass or offal may be taken up by or in such stream, pond, lake, or reservoir, or who allows the carcass of any dead animal, or any offal of any kind, to remain in or upon the borders of any such stream, pond, lake, or reservoir, within the boundaries of any lands owned or occupied by him, or who keeps any horses, mules, cattle, swine, sheep, or live stock of any kind, penned, corraled, or housed on, over, or on the borders of any such stream, pond, lake, or reservoir, so that the waters thereof shall become polluted by reason thereof, is guilty of a misdemeanor, and

upon conviction thereof shall be punished as prescribed in section three hundred and seventy-seven of this Code. [In effect March 23, 1876.]

SEC. 376. Every master of a vessel subject to quarantine or visitation by the quarantine officer, arriving in the port of San Francisco, who refuses or omits—

1. To proceed with and anchor his vessel at the place assigned for quarantine, at the time of his arrival; or,

2. To submit his vessel, cargo, and passengers to the examination of the quarantine officer, and to furnish all necessary information to enable that officer to determine to what length of quarantine and other regulations they ought, respectively, to be subject; or,

3. To remain with his vessel at the quarantine during the period assigned for her quarantine, and while at quarantine to comply with the regulations prescribed by law, and with such as any of the officers of health, by virtue of authority given them by law, shall prescribe in relation to his vessel, his cargo, himself, his passengers, or crew, is punishable by imprisonment in the county jail not exceeding one year, or by fine not exceeding two thousand dollars, or both. [In effect March 9, 1878.]

SEC. 377. Every person who is charged with a duty relating to the registration of deaths, under chapter three, title seven, of the Act to establish a Political Code, approved March twelfth, eighteen hundred and seventy-two, who—

1. Willfully fails to keep a registry of the name, age, residence, and time of death of a decedent; or,

2. Willfully fails to register with the County Recorder a certified copy of such register, as is provided for in said chapter; or,

3. Willfully interments, cremates, or otherwise disposes of any human body, in any city, county, or city and county, without having first obtained a permit, as provided for in said chapter; or,

4. Willfully grants a permit for the interment, cremation, or disposition of a dead human body, without the certificate provided for in said chapter; or,

5. Willfully violates any of the laws of this State relating to the preservation of the public health—

Is guilty of a misdemeanor, and is, unless a different punishment for such violation is prescribed by this Code, punishable by imprisonment in the county jail not exceeding one year, or by fine not exceeding one thousand dollars, or by both such fine and imprisonment. [Approved February, 1889.]

SEC. 378. Every person charged with the performance of any duty under the laws of this State relating to the preservation of the public health, who willfully neglects or refuses to perform the same, is guilty of a misdemeanor.

SEC. 380. Every apothecary, druggist, or person carrying on business as a dealer in drugs or medicines, or person employed as clerk or salesman by such person, who, in putting up any drugs or medicines, or making up any prescription, or filling any order for drugs or medicines, willfully, negligently, or ignorantly omits to label the same, or puts an untrue label, stamp, or other designation of contents, upon any box, bottle, or other package containing any drugs or medicines, or substitutes a different article for any prescribed or ordered, or puts up a

greater or less quantity of any article than that prescribed or ordered, or otherwise deviates from the terms of the prescription or order which he undertakes to follow, in consequence of which human life or health is endangered, is guilty of a misdemeanor, or if death ensues, is guilty of a felony.

SEC. 382. Every person who adulterates or dilutes any article of food, drink, drug, medicine, spirituous or malt liquor, or wine, or any article useful in compounding them, with a fraudulent intent to offer the same, or cause or permit it to be offered for sale as unadulterated or undiluted, and every person who fraudulently sells, or keeps, or offers for sale the same as unadulterated or undiluted, is guilty of a misdemeanor.

SEC. 383. Every person who knowingly sells, or keeps, or offers for sale, or otherwise disposes of any article of food, drink, drug, or medicine, knowing that the same has become tainted, decayed, spoiled, or otherwise unwholesome or unfit to be eaten or drank, with intent to permit the same to be eaten or drank, is guilty of a misdemeanor.

SEC. 394. Every person who willfully exposes himself, or another, afflicted with any contagious or infectious disease, in any public place or thoroughfare, except in his necessary removal in a manner the least dangerous to the public health, is guilty of a misdemeanor.

SEC. 400. Any person, persons, company, or corporation, who shall bring, or cause to be brought, or aid in bringing into this State any sheep, hog, horse, or cattle of any kind, or any domestic animals of any kind, knowing the same to be affected with any contagious or infectious diseases, shall be guilty of a misdemeanor. [As amended and approved March 19, 1889.]

SEC. 401. Every person who adulterates candy, by using in its manufacture terra alba, or any other deleterious substance or substances, or who sells, or keeps for sale, any candy or candies adulterated with terra alba, or any other deleterious substance or substances, is guilty of a misdemeanor. [In effect March 16, 1878.]

SEC. 402. Every animal having glanders or farcy shall at once be deprived of life by the owner or person having charge thereof, upon discovery or knowledge of its condition; and any such owner or person omitting or refusing to comply with the provisions of this section shall be guilty of a misdemeanor. [In effect April 16, 1880.]

OTHER PENAL STATUTES.

CHAPTER CXCV.

An Act to encourage the production and sale of pure and wholesome milk, and to prohibit and punish the production or sale of unwholesome or adulterated milk.

[Approved March 12, 1870.]

SECTION 1. It shall be unlawful for any person or persons to sell, exchange, or distribute, or expose for sale, exchange, or distribution, any impure, adulterated, or unwholesome milk; or to adulterate any milk for

the purpose of offering the same for sale, exchange, or distribution; or to keep any cows for the production of milk for market, sale, exchange, or distribution, in a crowded and unhealthy condition; or to feed the same on any food which would produce impure, diseased, or unwholesome milk; and every person or persons who shall engage in or carry on the sale, exchange, distribution, or any traffic in milk, shall have the cans in which the milk is exposed for sale, exchange, or distribution, and the vehicle from which the same is vended, exchanged, or distributed, conspicuously marked with his or their names; also indicating by said mark the locality from whence said milk is obtained or produced, and any sale, distribution, or exchange of any milk in cans or by a vehicle so marked as to convey the idea that said milk was produced from a different locality than it really was, shall be and is hereby forbidden.

SEC. 2. Any person violating any of the provisions of this Act shall be deemed guilty of a misdemeanor, and be punished by a fine not less than one hundred dollars for the first offense, and double such amount for each subsequent offense, and by imprisonment according to law, if such fine be not paid. One half of such fine shall be paid to the informer or prosecuting witness, and the other half to the School Fund of the county. And any person may be compelled to testify concerning violations of this Act; but such testimony shall not be used against such witness in any criminal prosecution.

SEC. 3. The Health Officer and Health Inspectors of the City and County of San Francisco shall inform against and diligently prosecute all persons violating the provisions of this Act.

SEC. 4. This Act shall take effect immediately after its passage.

CHAPTER CCCCXCVI.

An Act concerning lodging houses and sleeping apartments.

[In effect April 3, 1876.]

SECTION 1. Every person who owns, leases, lets, or hires to any person or persons, any room or apartment in any building, house, or other structure, within the limits of any incorporated city, or city and county, within the State of California, for the purpose of a lodging or sleeping apartment, which room or apartment contains less than five hundred cubic feet of space, in the clear, for each person so occupying such room or apartment, shall be deemed guilty of a misdemeanor, and shall, upon conviction thereof, be punished by a fine of not less than fifty dollars or more than five hundred dollars, or by imprisonment in the county jail, or by both such fine and imprisonment.

SEC. 2. Any person or persons found sleeping or lodging, or who hires for the purpose of sleeping in or lodging in any room or apartment which contains less than five hundred cubic feet of space, in the clear, for each person so occupying such room or apartment, shall be deemed guilty of a misdemeanor, and shall, upon conviction, be punished by a fine of not less than ten nor more than fifty dollars, or by both such fine and imprisonment.

SEC. 3. It shall be the duty of the Chief of Police, or such other

person to whom the police powers of the city are delegated, to detail a competent and qualified officer or officers of the regular force to examine into any violation of any of the provisions of this Act, and to arrest any person guilty of any such violation.

SEC. 4. The provisions of this Act shall not be construed to apply to hospitals, jails, prisons, insane asylums, or other public institutions.

SEC. 5. All Acts or parts of Acts in conflict with the provisions of this Act are hereby repealed.

CHAPTER CLXXXIX.

An Act to regulate the sale of certain poisonous substances.

[Approved April 16, 1880.]

SECTION 1. It shall be unlawful for any person to retail any of the substances poisonous, and by reason thereof dangerous to human life, without distinctly labeling the bottle, box, vessel, or package, and the wrapper or cover thereof in which such substance is contained, with the common or usual name thereof, together with the word "poison," and the name and place of business of the seller. Nor shall it be lawful for any person to retail any of the substances enumerated in either of said schedules to any person, unless, on due inquiry, it is found that the person receiving the same is aware of its poisonous character, and that it is to be used for a legitimate purpose.

SEC. 2. It shall be unlawful for any person to retail any of the substances enumerated herein, unless, before delivering the same, such person shall make, or cause to be made, in a book kept for that purpose only, an entry stating the date of the sale, the name and address of the purchaser, the name and quality of the substance sold, the purpose for which it is stated by the purchaser to be required, and the name of the dispenser. The book required by this Act shall be always open to inspection by the proper authorities. It shall also be the duty of the person dispensing any of the substances enumerated in either of said schedules to ascertain, by due inquiry, whether the name and address given by the person receiving the same are his true name and address, and for that purpose may require such person to be identified.

SEC. 3. Any person who shall dispense any of the substances enumerated in either of said schedules without complying with the regulations herein prescribed, shall, for every such offense, be deemed guilty of a misdemeanor, and, upon conviction thereof, shall be punished by a fine not exceeding five hundred dollars, or by imprisonment in the county jail not exceeding six months, or by both such fine and imprisonment; *provided*, that nothing in this Act shall be so construed as to apply to the prescriptions of any physician authorized to practice medicine under the laws of this State.

SCHEDULE "A."

Arsenic, corrosive sublimate, hydrocyanic acid, cyanite of potassium, strychnia, essential oil of bitter almonds, opium, aconite, belladonna, conium, nux vomica, henbane, tansy, savin, ergot, cotton root, digitalis,

chloroform, chloral hydrate, and all preparations, compounds, salts, extracts, or tinctures of such substances, except preparations of opium containing less than two grains to the fluid ounce.

SCHEDULE "B."

White precipitate, red precipitate, red and green iodides of mercury, colchicum, cantharides, oxalic acid, croton oil, sulphate of zinc, sugar of lead, carbolic acid, sulphuric acid, muriatic acid, nitric acid, phosphorus, and all preparations, compounds, salts, extracts, or tinctures of such substances.

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